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NX70/NX700 Serial Communications Unit (SCU) User Manual

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Because of these differences, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Samsung Automation be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Samsung Automation cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Samsung Automation. with respect to use of information, circuits, equipment, or software described in this manual.

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Throughout this manual we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances which may lead to serious personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to minor personal injury, property damage, economic loss, or product malfunction. However, depending on circumstances, failure to follow the directions accompanying this symbol may also lead to serious consequences.

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Safety Instructions

Please read this manual and the related documentation thoroughly and familiarize yourself with product information, safety instructions and other directions before installing, operating, performing inspection and preventive maintenance. Make sure to follow the directions correctly to ensure normal operation of the product and your safety. Otherwise it may cause overheating and product

WARNING

- If this product is used in a situation that may cause personal injury and/or significant product damage, implement safe measures such as use of fault-safe equipment.
- Do not use this product under any conditions exposed to explosive gases. It may cause an explosion.

ATTENTION

- Make sure to use an external device when configuring the protective circuit breakers for emergencies or interlock circuits.
- Fasten the terminal screws tightly to ensure that the cable connection is secure. Incorrect cable connection may cause overheating and product malfunction.
- Operate and keep the product under the allowed conditions directed in product specifications. Otherwise it may cause overheating and product malfunction.
- Do not disassemble or remodel the product. Otherwise it may cause an electric shock or malfunction.
- Do not touch the terminals when the power is on. Otherwise it may cause an electric shock.

Installation Environment for SCU (Serial Communication Unit)

ATTENTION

Do not install your analog conversion modules if any of the following conditions are present:

- Ambient temperature outside the range of 0 to 55 °C (32 to 131 °F).
- Direct sunlight.
- Humidity outside the range of 30% to 85% (Non-condensing).
- Chemicals that may affect electronic parts.
- Excessive or conductive dust, or salinity.
- High voltage, strong magnetic fields, or strong electromagnetic influences.
- Direct impact and excessive vibration.

ATTENTION

Installing the SCU Module on the System

1. Connect a communication cable to the SCU module.
2. Turn on the power to the external device connected to the SCU module.
3. Turn on the main PLC power.

ATTENTION

Removing the SCU Module from the System

1. Turn off the main PLC power.
2. Turn off the power to the external device connected to the SCU module.
3. Remove the communication cable.

ATTENTION

Preventing SCU Module Malfunctions

- Be sure to power off the PLC system before installing or removing an SCU module.
- Ensure that the SCU module is secured onto the backplane before operating it.
- Be cautious of metal chips when wiring for the SCU module. Metal chips and debris that fall into the module can cause damage.
- Do not touch with your hand the connector on the bottom of the module which is used to connect to the backplane . Otherwise, it can cause connection fault and static electrical discharges.
- Do not drop or impose impact to the SCU module. It can cause damage because the housing is made of injection-molded plastics.

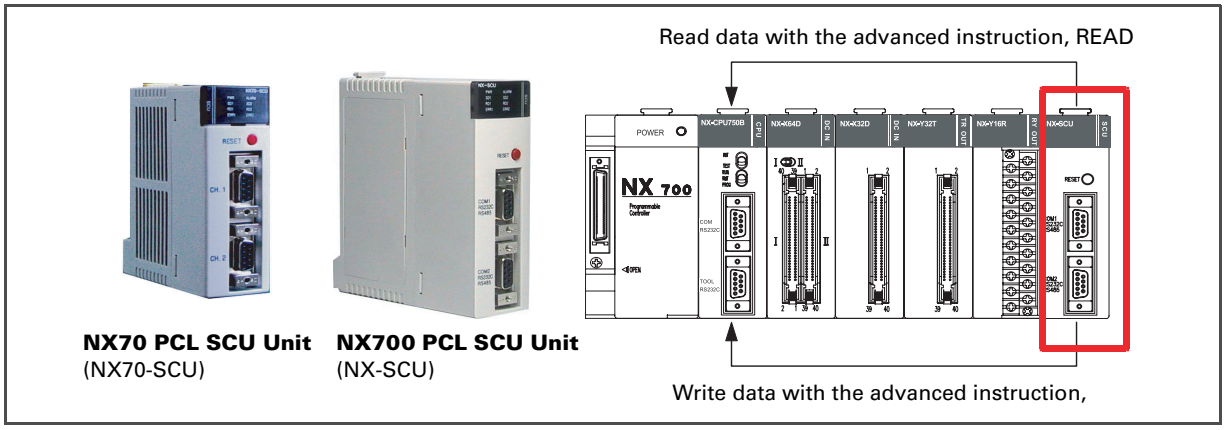
ATTENTION

Preventing PLC System Malfunctions

- Use an isolation transformer and line filter on the incoming power to the PLC when there is equipment using or producing high current, high voltage, or large magnetic fields in the vicinity.
- Use analog sensor that meets the rated specifications for module connection. Otherwise, it may cause operation errors.
- Separate the main PLC power line ground from all other power grounds. Always use class 3 grounding.
- Do not exceed the current and power rating of the external 24 VDC provided by the PLC power supply.
- Avoid system faults due to programming errors by reading and fully understanding this system manual and the PLC instruction set.
- Perform regular preventive maintenance on installed systems, checking devices and wiring for potential breakdowns and failures.

Specifications and Components

Exchange data with RS232C or RS485 communication devices, such as barcode reader (RS232C) and network inverter (RS458). ASCII and HEX (Binary) data transfer is enabled with ladder program. (SCU unit = the existing features of SDU unit + 485 communication)



SCU Features

1. Two channels are implemented on a single unit (RS232C, RS485 selectable).
2. Data input/output with simple sequence instructions.
   Use PLC advanced instruction READ to read data from the SCU, and WRITE to write data to the SCU. CPU unit and SCU will handle the task with shared memory, so there is no need for writing complicated programs.
3. SCU unit is equipped with RS-485 network feature, added to the existing N-series SDU module features, expanding its scope of usage.
4. RS232C or RS485 communication network is available.
   Data input/output with RS232 devices:
   Connect to and exchange data with devices like IDX display, measurement instrument, barcode reader, and printer. Data input/output with RS485 devices:
   Connect through network to temperature controller, network inverter, and network servo.
5. Unlimited mounting in PLC slots, 500 byte transmission capability.

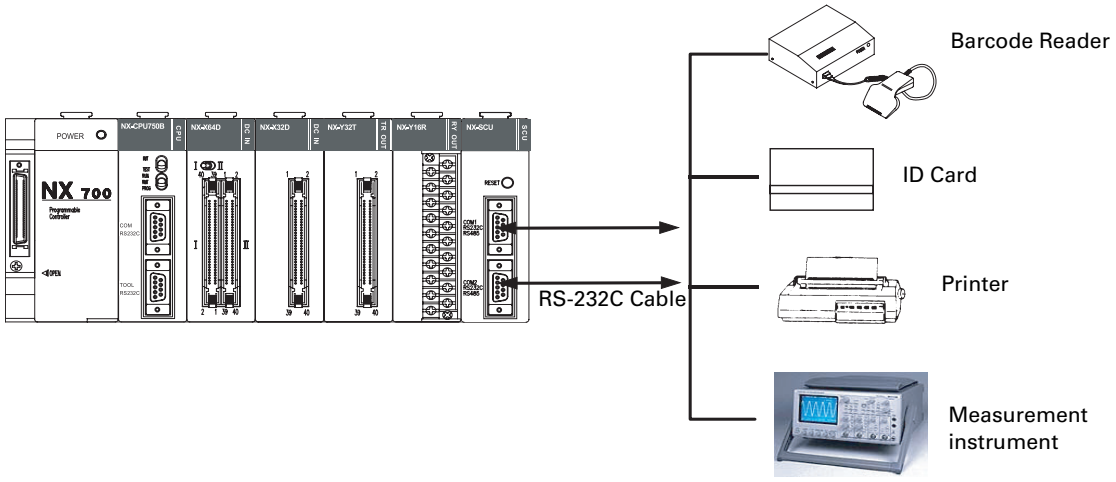
6. Both ASCII and HEX (binary) can be used as transmission code.

7. End code can be configured freely with PLC ladder instructions.

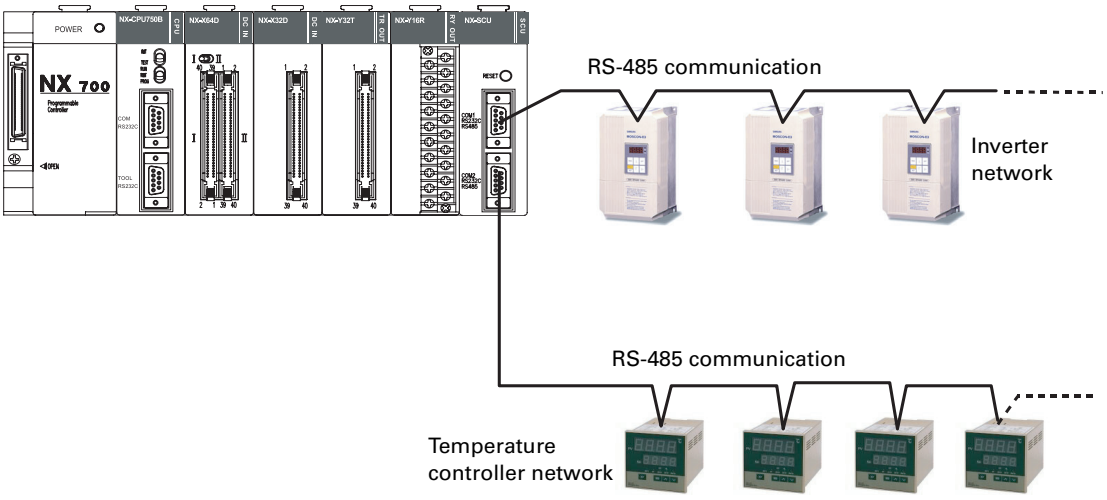
NOTE In addition to this Manual, please refer to System Manual and Programming Manual for the PLC when using SCU.

System Configuration

Using RS232C Communication



Using RS485C Communication



You can connect RS232C device/RS485 network device to each RS232C/RS485 (CH1, CH2) channel.

NX series SCU can be mounted anywhere you want regardless of whether the backplane is base or expansion. The number of SCU mounting is not limited.

Specifications

General Specifications

Item		Specifications
Temperature	Operating	0 °C to +55 °C (32 °F to 131 °F)
	Storage	-25 °C to +70 °C (-13 °F to 158 °F)
Humidity	Operating	30 to 85% RH (Non-condensing)
	Storage	30 to 85% RH (Non-condensing)
Withstand voltage		500 V ac for 1 minute between I/O terminal (dc) and frame ground (power unit)
Insulation resistance		100 MΩ or more at 500 mega V dc between I/O terminal (dc) and frame ground (power unit)
Vibration immunity		10 to 55Hz, 1 cycle/minute: double amplitude of 0.75 mm, 10 minutes on 3 axis (X,Y, Z)
Shock immunity		Peak acceleration and duration 15g/11 ms, 3 times in each X, Y, Z direction
Noise immunity		1500 Vp-p with 50ns to 1μs pulse width (generated by noise simulator)
Ambience		No corrosive gas, no excessive dust
Occupied I/O points		32 points (16 points input, 16 points output)
Max. number of unit		Unlimited

Performance Specifications

Item	Specifications
Interface	RS232C/RS485 2 ports
Transmission speed	Configured with DSW1 and DSW2 1) Using RS232C: 300/600/1200/4800/9600/19200/38400bps 2) Using RS485: 4800/9600/19200/38400bps
Communication method	Half duplex
Synchronization method	Start-stop method
Transmission distance	Using RS232C: 15m (MAX), Using RS485: 1.2 Km
Transmission code	ASCII or HEX (Binary)
Transmission data format	STOP bit 1bit/2bit
	Parity (even/odd)
	Data length 7bit/8bit
Data transmission order	From bit 0, by each character
Transmission unit	A message, to the end code (length adjustable)
Max. message length	MAX. 500 Byte/frame (including end and start codes)
Interface with CPU unit	Shared memory type: N-series: Read and write data with advanced instructions F150 (READ) and F151 (WRITE). Read and write data with advanced instructions READ and WRITE.
I/O allocation	16 points input and 16 points output allocated.
End code setting	Select from three types of ① cr ② cr+LF ③ ETX or set arbitrary code from shared memory.
Start code	Start code
Other special controls	End code cut transmission mode (control by sequence instruction), Convenient for printing out.
	Soft reset (control by sequence instruction)

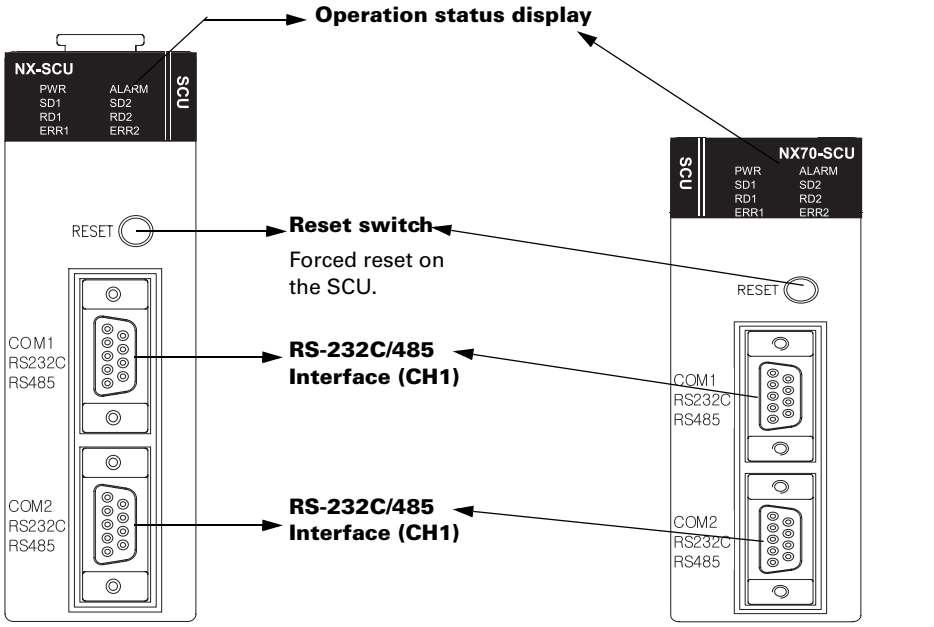
NOTE SCU module is configured as 32 points I/O module with 16 points input and 16 points output. (For N-series, I/O is allocated by WinFPST S/W and registered as 16SX and 16SY.)

Unit Diagram

Front View

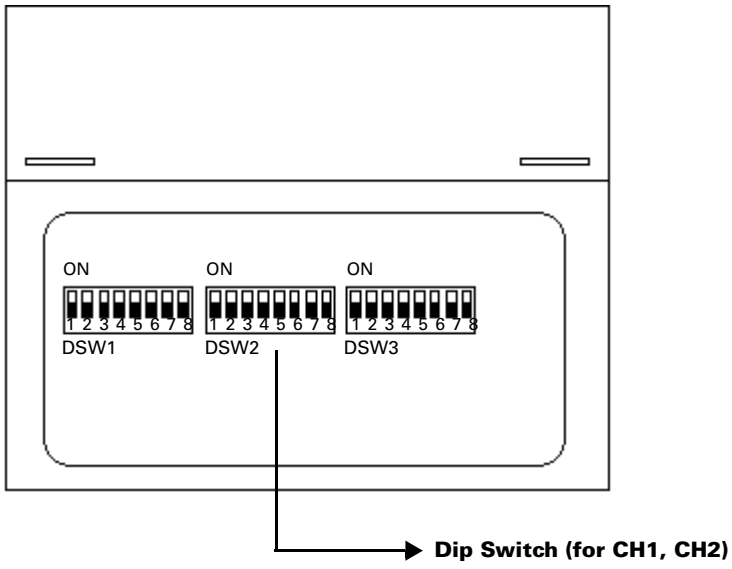
NX700 SCU (NX-SCU)

NX70 SCU (NX70-SCU)



Inside View

NX700 SCU (NX-SCU)

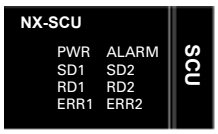


NOTE Dip switch is located on the bottom of NX70 SCU (NX70-SCU).

Operation Status Display and Functions

SCU operation and communication status is displayed on the LED on the top of the front panel.

SCU front display window



NX700 SCU
(NX-SCU)

NX70 SCU
(NX70-SCU)

Implications

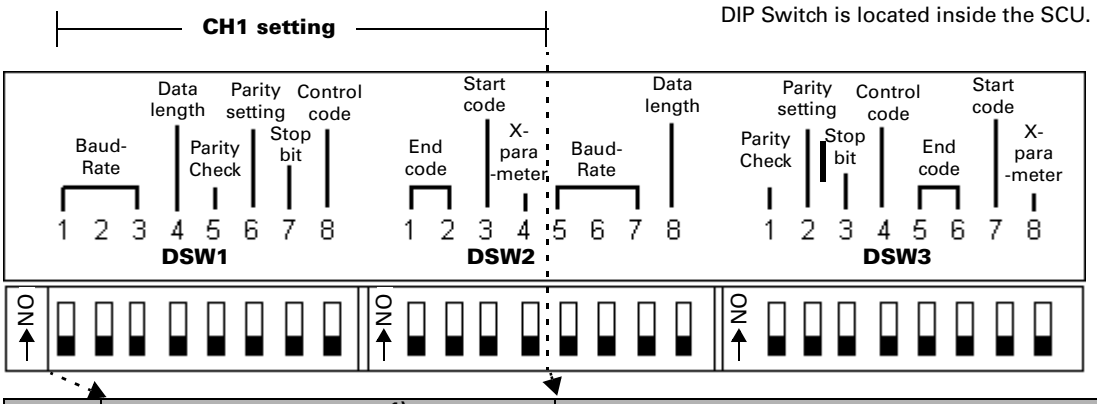
LED items		Function
Power (PWR)		● (On): Unit in operation ○ (Off): Power turned off
Operation error (ALARM)		● (On): Operation error Turned on when watchdog timer identifies an error. (Press the Reset switch to turn off.) ○ (Off): Normal operation
CH.1	Sending data monitor (SD 1)	◎ (Flickering): Sending data ○ (Off): No sending data.
	Receiving data monitor (RD 1)	◎ (Flickering): Receiving data ○ (Off): No receiving data.
	Communication error (ERR 1)	● (On): Communication error ○ (Off): Normal communication
CH.2	Sending data monitor (SD 2)	◎ (Flickering): Sending data ○ (Off): No sending data.
	Receiving data monitor (RD 2)	◎ (Flickering): Receiving data ○ (Off): No receiving data.
	Communication error (ERR 2)	● (On): Communication error ○ (Off): Normal communication

NOTE

- Communication error LED (ERROR LED) turns on when parity or framing error occurs.
  Receiving: Parity, framing ERROR
  Sending: No end code
- Communication error LED turns off when normal frame is received or sent (writing to shared memory).

DIP Switch Settings

CH1 Setting



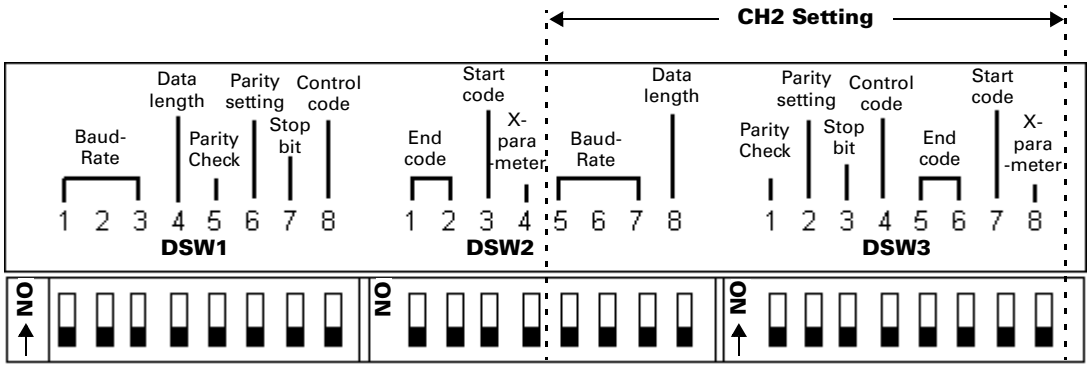
	Bit location[1]												Function	
	1	2	3	4	5	6	7	8	1	2	3	4		
DSW1	0	0	0										38400 Bps	
	1 0 1 0 1 0 1	0 1 1 0 0 1 1	0 0 0 1 1 1 1										Transmission speed (BAUD RATE) (see below)	19200 Bps 9600 Bps 4800 Bps 2400 Bps 1200 Bps 600 Bps 300 Bps
				0 1									Data length	7 BIT 8 BIT
					0 1								Parity check (see below)	Invalid Valid
						0 1							Parity setting	Odd parity (ODD) Even parity (EVEN)
							0 1						STOP bit length	1 STOP Bit 2 STOP Bit
								0 1					Control signal (see below) (CTS, CD)	Not used Used
DSW2									0 1 0 1	0 0 1 1			End code (see below)	Set to shared memory (1 byte) CR (0DH) code CR (0DH), LF (0AH) code ETX (03H) code
											0 1		Start code (see below)	STX (02H) not used STX (02H) used
												0 1	X-Parameter	Not support

1) "0"stands for OFF. "1" stands for ON.

ATTENTION

- When using RS485, the available baud rates are 38,400/19,200/9,600/4,800bps.
- When parity check is set to Invalid, the parity settings are not applied.
- For control signal, the CTS and CD settings can be selected, but set it to Not Applicable when using [3-wire method without flow control]. (using RS232C communication)
- Start and end codes determine the start and end of a communication frame.

CH2 Setting



	Bit location[1]												Function	
	1	2	3	4	5	6	7	8	1	2	3	4		
DSW2	0	0	0										38400 Bps	
	1 0 1 0 1 0 1	0 1 1 0 0 1 1	0 0 0 1 1 1 1										Transmission speed (BAUD RATE) (see below)	19200 Bps 9600 Bps 4800 Bps 2400 Bps 1200 Bps 600 Bps 300 Bps
				0 1									Data length	7 BIT 8 BIT
					0 1								Parity check (see below)	Invalid Valid
						0 1							Parity setting	Odd parity (ODD) Even parity (EVEN)
							0 1						Stop bit length	1 Stop Bit 2 Stop Bits
								0 1					Control signal (see below) (CTS, CD)	Not used Used
DSW3									0 1 0 1	0 0 1 1			End code (see below)	Set to shared memory (1 byte) C_R ($0D_H$) code C_R ($0D_H$), L_F ($0A_H$) code ETX (03_H) code
											0 1		Start code (see below)	STX (02h) not used STX (02h) used
												0 1	X-Parameter	Not support

1) "0" stands for OFF. "1" stands for ON.

ATTENTION

- When using RS485, the available baud rates are 38,400/19,200/9,600/4,800bps.
- When parity check is set to Invalid, the parity settings are not applied.
- For control signal, the CTS and CD settings can be selected, but set it to Not Applicable when using [3-wire method without flow control]. (using RS232C communication)
- Start and end codes determine the start and end of a communication frame.

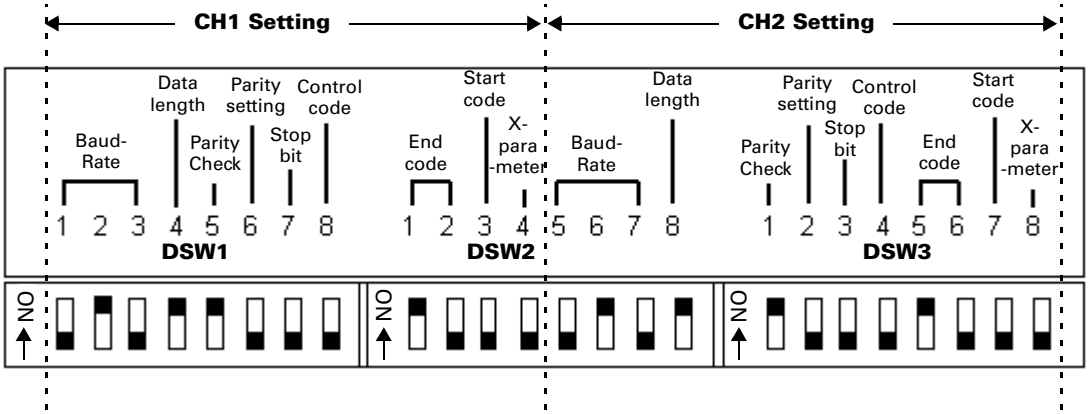
EXAMPLE (DSW Settings)

CH1 setting

Transmission speed: 9600 bps
Data length: 8 bit
Parity Check: Valid
Parity Bit: Odd
Stop Bit: 1 Bit
Control signal: Not applicable
End code: CR
Start code: Not used
X-Parameter: Disabled

CH2 setting

Transmission speed: 9600 bps
Data length: 8 bit
Parity Check : Valid
Parity Bit: Odd
Stop Bit: 1 Bit
Control signal: Not used
End code: CR
Start code: Not used
X-Parameter: Disabled



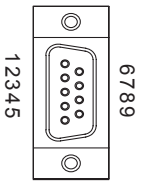
Wiring

Wiring

RS232C/RS485 INTERFACE

SCU Connection Signal

PIN NO	Signal Name	Mnemonic	Direction SCU External device
1	FRAME GROUND	FG	
2	SEND DATA	SD	→
3	RECEIVE DATA	RD	←
4			
5	SIGNAL GROUND	GND	←
6	485 TRANSIVER-	485-	↔
7	485 TRANSIVER+	485+	↔
8			
9	POWER	+5V	



Connector (9P)

- External device referred above means a variety of RS232 and RS485 devices.
- Typical wiring methods are as follows:
  1. RS232 Wiring: 3-wire method without flow control (common wiring method)
  2. RS485 Wiring: End termination resistance is built-in.

RS232 Wiring Diagram

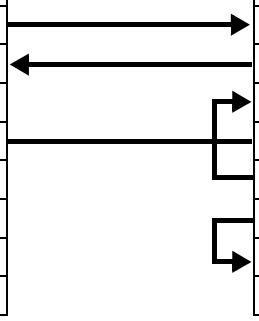
3-wire method without flow control (RS232 device - 9 pin)

SCU (9P)

PIN NO	Mnemonic
1	
2	SD
3	RD
4	
5	SG
6	RS485-
7	RS485+
8	
9	

RS-232 device (9P)

PIN NO	Mnemonic
1	FG
2	RD
3	SD
4	DTR
5	SG
6	DSR
7	RTS
8	CTS
9	RI



ATTENTION

Turn off the DSW1 No. 8 or DSW3 No.4 which are the control codes.

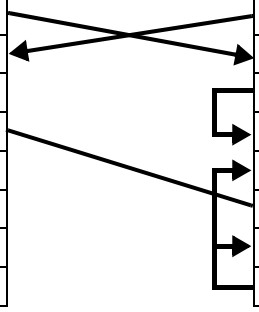
3-wire method without flow control (RS232 device-25 pin)

SCU (9P)

PIN NO	Mnemonic
1	
2	SD
3	RD
4	
5	SG
6	RS485-
7	RS485+
8	
9	

RS-232 device (25P)

PIN NO	Mnemonic
1	FG
2	SD
3	RD
4	RTS
5	CTS
6	DSR
7	SG
8	CD
20	DTR



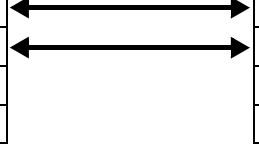
RS485 Wiring Diagram

SCU (9P)

PIN NO	Mnemonic
1	
2	
3	
4	
5	
6	485+
7	485-
8	
9	

RS-485 device

	Mnemonic
	485+
	485-



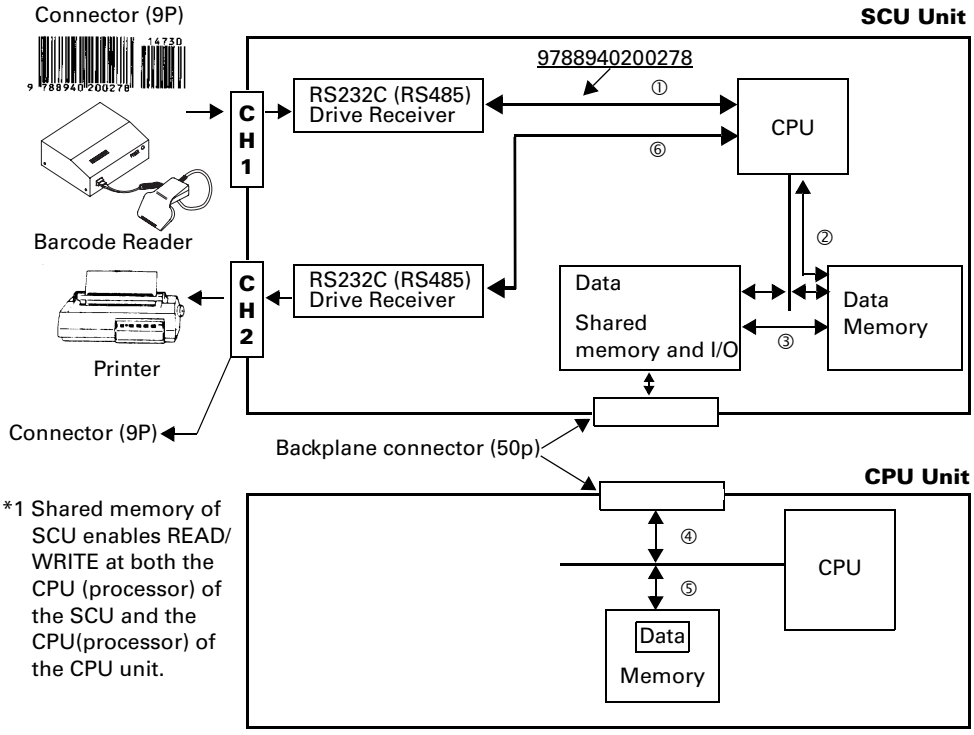
3

Operations and Programming Examples

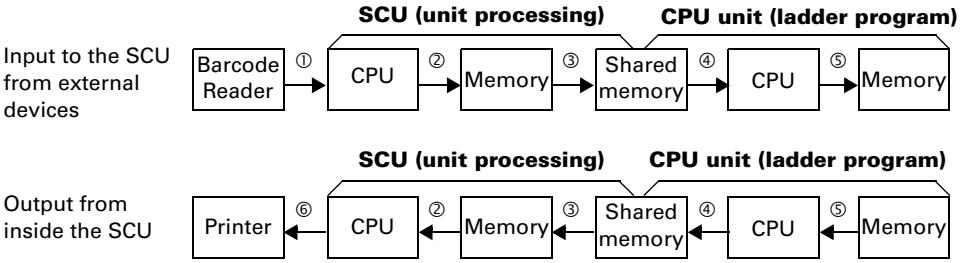
Basic Operations

- You need ladder program to operate the SCU.
- Data exchanges between this unit and CPU unit is transmitted via shared memory.
- Data input from external devices is stored in shared memory only when there is an end code in the data.
- Data is automatically output when written to shared memory.

The following diagram shows the data flow in each case of barcode reader connected or printer connected.



*1 Shared memory of SCU enables READ/ WRITE at both the CPU (processor) of the SCU and the CPU(processor) of the CPU unit.



ATTENTION

Products like ID-X, where I/O (sending/receiving) passes through only one channel, can be operated as half duplex.

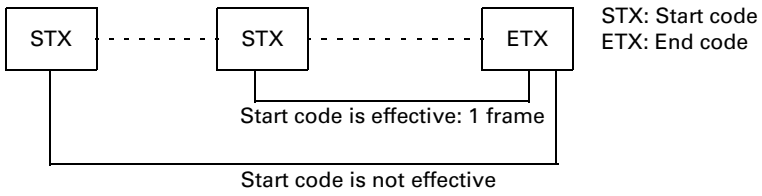
The SCU performs communications regardless of PROG/RUN mode, but data transmission is available only in RUN mode.

Precautions for SCU Operation

For ASCII communication of Rs232C/RS485

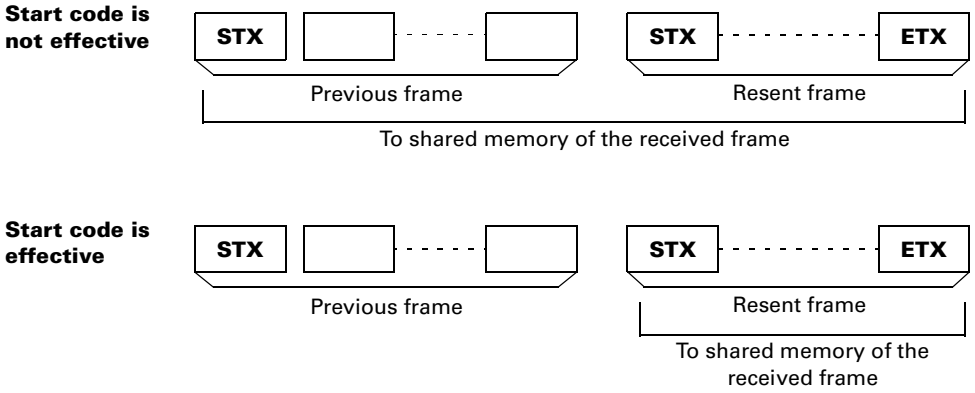
- Errors of transmission processing are reflected at contacts (NX series: X4 to XD, NX plus series: R0.4 to R0.13) so resending with ladder program is recommended. (See below)
  If an error occurs while the frame is receiving, the frame will be cleared and error LED turns on. But if the next frame is a normal frame, the error LED turns off and the frame is processed as the received frame.
- When the start code is effective, the frame will start at the last receiving start code and end at the end code.

[Ex]



1. When the end code is not received due to communication trouble, the SCU stands by until the end code is received.
2. You can prevent a prolonged stand-by as follows:
   Request resending to the external RS232C (RS485) device.
   If resending is not available at the other RS232C (RS485) device, perform time-up process with ladder program and request resending to the external device.

3. The SCU buffer status when resending from the external RS232C (RS485) device is as follows:



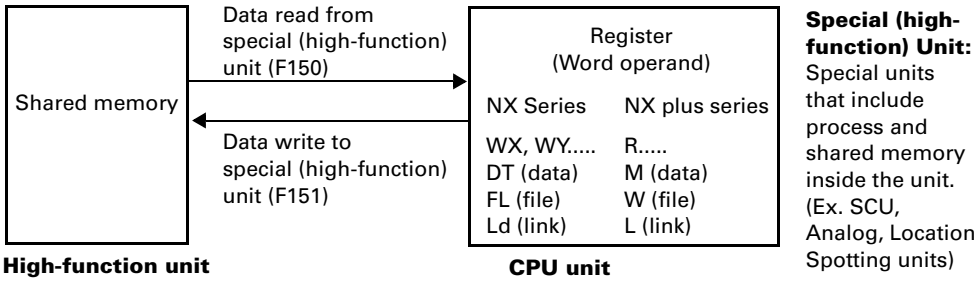
- Software reset is available when resetting the SCU in emergency.
  1. Turn **Y1D (R1.13)** on with ladder program to reset. (Software reset)
  2. It takes approx. 1msec from software reset request to complete initialization.
  3. **XE (R0.14)** turns on when initialization completes.
- Ensure the following when set end code with shared memory.(The end code is read from shared memory at every sending and receiving process.)
  1. Sending: Set the end code before sending request.
  2. Receiving: Set the end code before the external RS232C (RS485) device starts transmission.
- When Y1E (R1.14) → (CH1), Y1F (R1.15) → (CH2) is turned on, the end code transmission can be disabled. (Convenient for output to the printer.)

  Make sure to turn on **Y1E (R1.14)** and **Y1F (R1.15)** before sending request.

Programming

Send and receive data with CPU unit ladder program for data READ / WRITE with shared memory in the SCU. Two advanced instructions are used for this: **READ (F150)** and **WRT (F151)**.

In addition, handshake for data READ/WRITE will be determined by contact on/off (two points for each X and Y).



Special (high-function) Unit: Special units that include process and shared memory inside the unit. (Ex. SCU, Analog, Location Spotting units)

Program Configuration

- A program consists of handshake with shared memory and advanced instructions.

  See *"Timing for Sending and Receiving" on page 25* for detailed information on handshake timing.

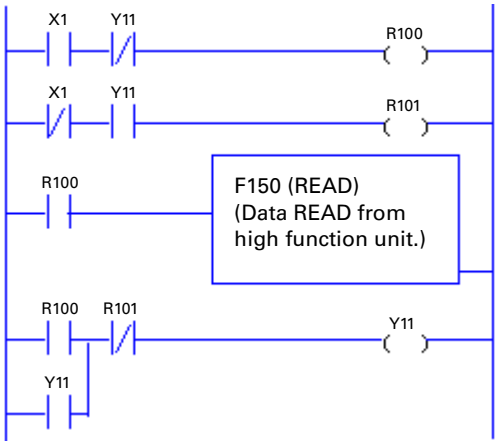
  See *"Advanced Instructions" on page 27* for detailed information on PLC advanced instructions.

  See *"Shared Memory Allocation Table" on page 29* for detailed information on shared memory.

  See *"I/O Allocation Table" on page 31* for detailed information on I/O allocation.

Using READ in WinFPST
(Receiving from external RS232C (RS485) device)

When SCU is installed in the first slot of PLC system and external RS232C (RS485) is connected to CH1.



Condition for READ

Condition for READ completion

READ

READ completion signal
(Output to the SCU unit)

X1: For CH1 receiving

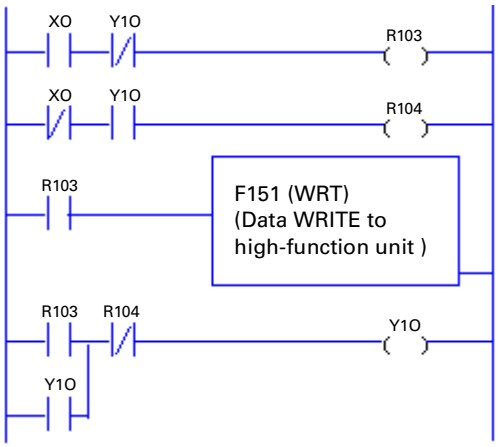
X1 turns on when normal data is input to the RS232C (RS485) device connected to CH1.

Y11: For CH1 receiving

When reading received data from shared memory, turn on Y11.
Turn on Y11 when X1 is turned off.

Using WRITE in WinFPST
(Transmitting to external RS232C (RS485) device)

When SCU is installed in the first slot of PLC system and external RS232C (RS485) is connected to CH1.



Condition for WRITE

Condition for WRITE completion

WRITE

WRITE completion signal
(Write to the SCU unit)

X0: For CH1 sending

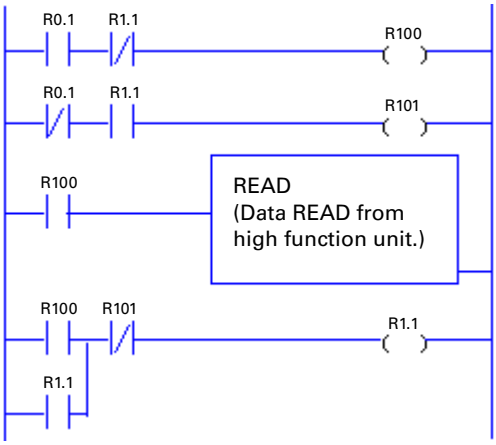
When the SCU received correct data, X0 turns on.

Y10: For CH1 sending

When writing sending data to shared memory,
turn on Y10.
Turn off Y10 when X0 is turned on.

Using READ in WinGPC
(Receiving from external RS232C (RS485) device)

When SCU is installed in the first slot of PLC system and external RS232C (RS485) is connected to CH1.



Condition for READ

Condition for READ completion

READ

READ completion signal
(Output to the SCU unit)

R0.1: For CH1 receiving

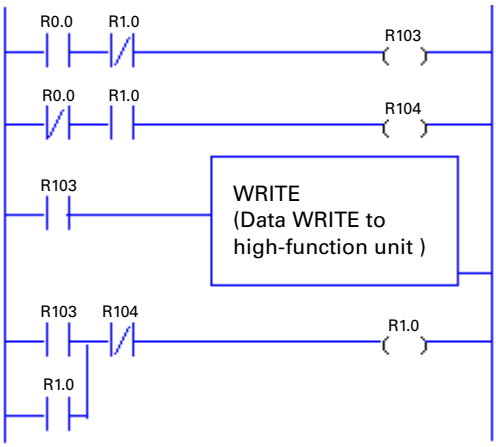
R0.1 turns on when normal data is input to the RS232C (RS485) device connected to CH1.

R1.1: For CH1 receiving

When reading received data from shared memory, turn on R1.1.
Turn on R1.1 when R0.1 is turned off.

Using WRITE in WinGPC
(Transmitting to external RS232C (RS485) device)

When SCU is installed in the first slot of PLC system and external RS232C (RS485) is connected to CH1.



Condition for WRITE

Condition for WRITE completion

WRITE

WRITE completion signal
(Write to the SCU unit)

R0.0: For CH1 sending

When the SCU received correct data, R0.0 turns on.

R1.0: For CH1 sending

When writing sending data to shared memory,
turn on R1.0.
Turn off R1.0 when R0.0 is turned on.

Timing for Sending and Receiving

Regardless of the slot location where the SCU is installed, sending and receiving is available. It is controlled by contacts on/off status. Per each CH, 2 points for sending and 2 points for receiving.

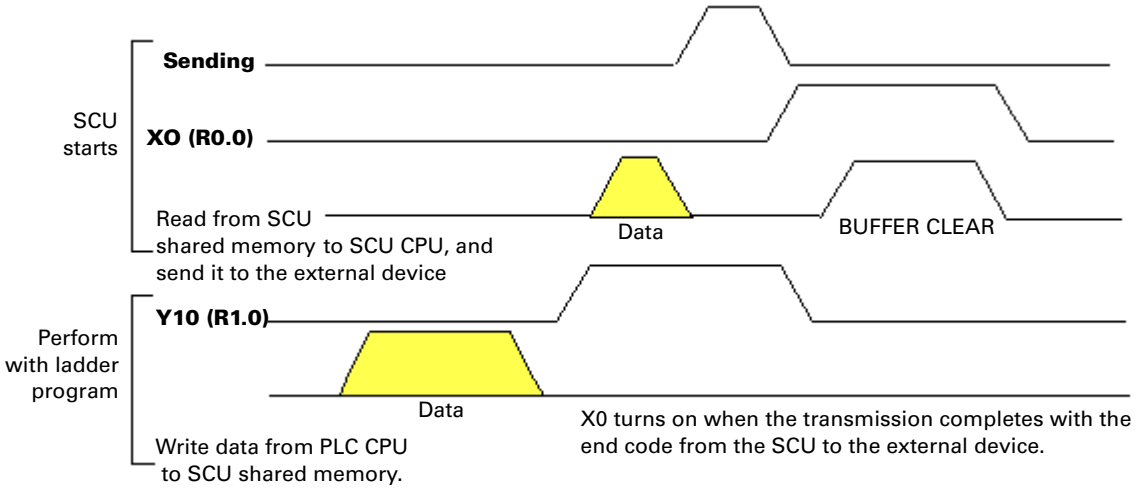
(Ex) When installed in slot 0

CH1	For sending	X0 (R0.0)	For receiving	X1 (R0.1)
		Y10 (R1.0)		Y11 (R1.1)
CH2	For sending	X2 (R0.2)	For receiving	X3 (R0.3)
		Y12 (R1.2)		Y13 (R1.3)

Timing Chart for CH1 using.

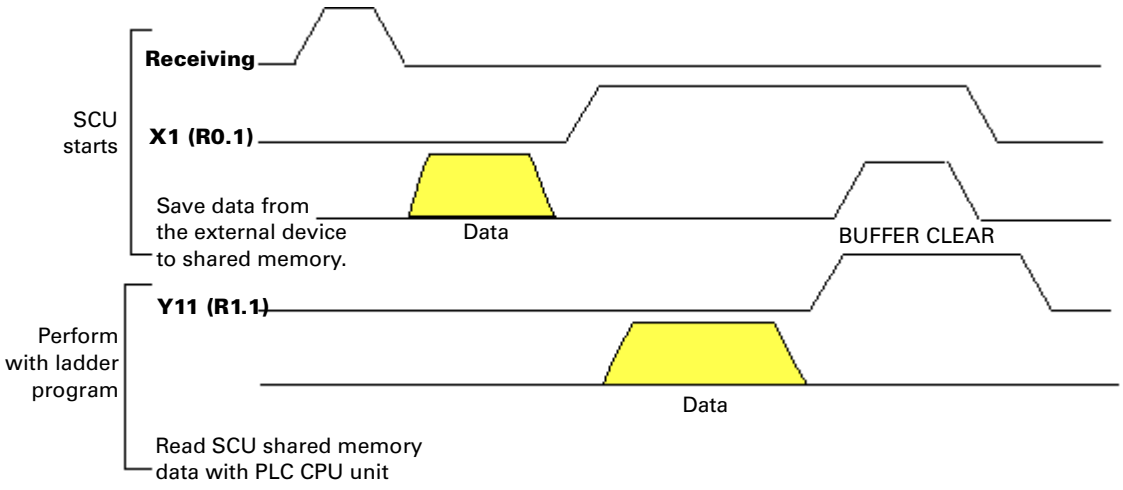
Sending

Data WRITE from PLC CPU to SCU shared memory, and **Y10 (R1.0)** on/off setting should be controlled by ladder program.


Sending
SCU starts
XO (R0.0)
Read from SCU shared memory to SCU CPU, and send it to the external device
Data
BUFFER CLEAR
Y10 (R1.0)
Perform with ladder program
Data
X0 turns on when the transmission completes with the end code from the SCU to the external device.
Write data from PLC CPU to SCU shared memory.

Receiving

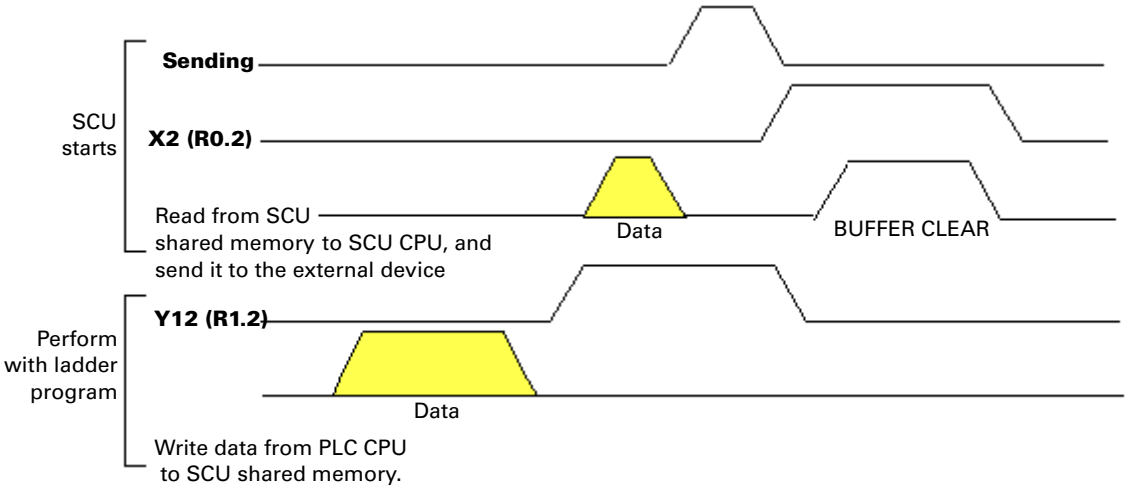
Data READ with PLC CPU from SCU shared memory, and **Y11 (R1.1)** on/off setting should be performed by ladder program.



Timing chart for CH2 using

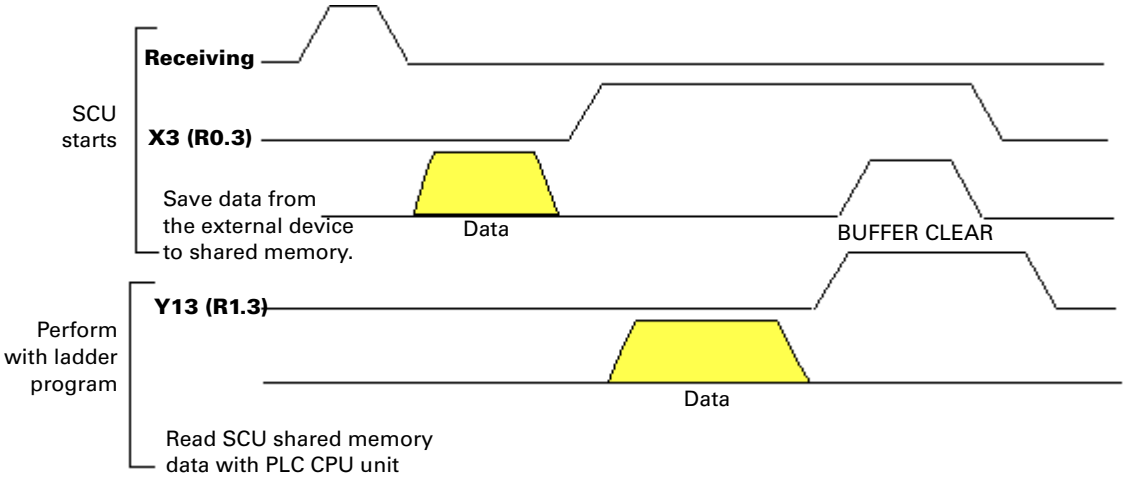
Sending

Data WRITE from PLC CPU to SCU shared memory, and **Y12 (R1.2)** on/off setting should be performed by ladder program.



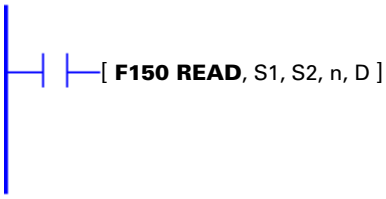
Receiving

Data READ with PLC CPU from SCU shared memory, and **Y13 (R1.3)** on/off setting should be performed by ladder program.



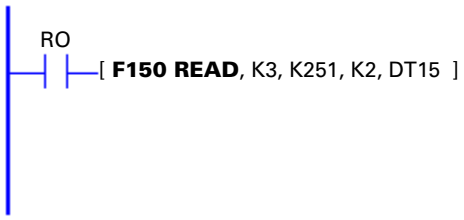
Advanced Instructions

Shared Memory instruction - READ in WinFPST



S1: Installation slot number of SCU unit.
S2: Starting address of shared memory where source data is stored.
n: The number of words of source data to read.
D: Starting address of PLC CPU where to store the read data.

[Programming Example]



K3: SCU slot (slot 0)
K251: SCU shared memory address (Address 251)
K2: The number of words of data to read (2 words)
DT15: Starting word operand of PLC CPU where to store the read data (DT15)

When R0 is on, the SCU shared memory address 251 (CH1 receiving buffer) reads two words of data and send it to NX700 PLC CPU data registers, DT15 and DT16.

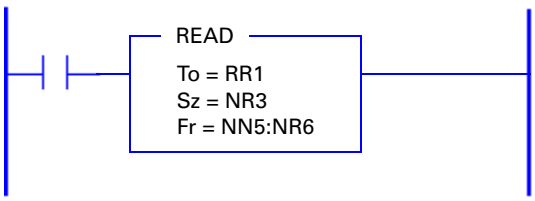
IMPORTANT

- The operands (called device, data, or register in other company's products) can be divided into **bit operand** that processes bit information and **word operand** that processes word information.

  Word operand: WX, WY, WR, WL, Ld, DT, FL, EV, SV, IX, IY.. I0 to ID

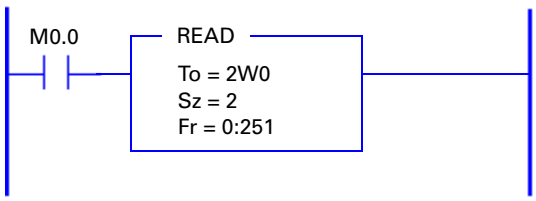
  Contact operand: X, Y, R, L, T, C... .
- F150 (READ) instruction processes word, so 10byte data is processes as 5 words.

Shared Memory instruction - READ in WinGPC



NN5 : Slot no. of SCU mounted. (Number, and first I/0 slot start from 0)
NR6 : Start address of shared memory of SCU (Word address)
NR3 : Number of words to be read
RR1 : Start word operand of PLC for storing read data

[Programming Example]



NN5(0) : Slot no. of SCU mounted. (Slot 0)
NR6(251) : shared memory address of SCU (address 251)
NR3(2) : the number of words to read (2 words)
RR1(W0) : First word operand of PLC to store read data (W0)

If M0.0 turns ON , 2 words data is read from shared memory address 251 (CH1 receiving buffer) of SCU installed in slot no.0, and send them to W0 of data register of PLC.

IMPORTANT

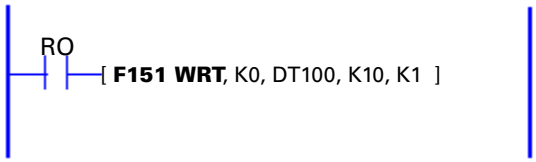
- The kinds of Operand (Data memory) for NX700/ NX70 PLC

  Data memory : R, L, K, M, F, W, SR ..
- As READ instruction is executed in the unit of word, 10 byte data become 5 words

Shared Memory instruction - WRITE in WinFPST

S1: Installation slot number of SCU unit
S2: Starting address of the CPU where the input data is stored.
n: The number of words of source data to write to the destination.
D: Starting address of SCU shared memory where the data will be stored.

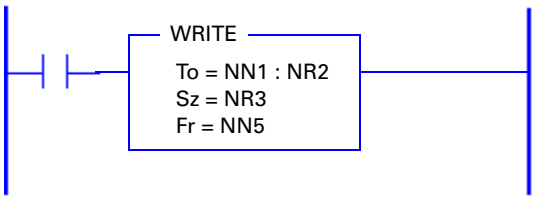
[Programming Example]



K0: SCU slot (slot 0)
DT100: Starting address of the PLC CPU where the input data is stored. (DT100)
K10: The number of words of source data to write to the destination. (2 words)
K1: Starting address of SCU shared memory where the data will be stored. (Address 1)

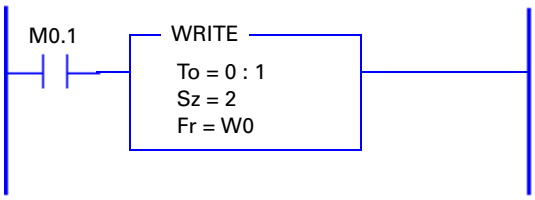
When R0 is on, 10 words from NX700 PLC data register DT100 (DT100 to DT109) will be sent to the SCU shared memory address 1 (CH1 sending buffer).

Shared Memory instruction - WRITE in WinGPC



NN1 : Slot no. of SCU mounted. (Number, and first I/0 slot start from 0)
NR2 :First address to write on the shared memory of SCU. (number/ register)
NR3 : Number of words to be written
NR5 : First address of data to writes (number/ register)

[Programming Example]



NN1(0) : Slot no. of SCU mounted. (Slot no. 0)
NR2(1) : First address to write on the shared memory of SCU. (address 1)
NR3(2) : Number of words to be written (2 words)
NN5(W0) : Start word operand of write data (W0)

When M0.1 becomes ON, 2 words from data register W0 of NX70/NX700 PLC is transmitted into shared memory address 1 (CH1 transmission buffer) of SCU installed in slot no. 0.

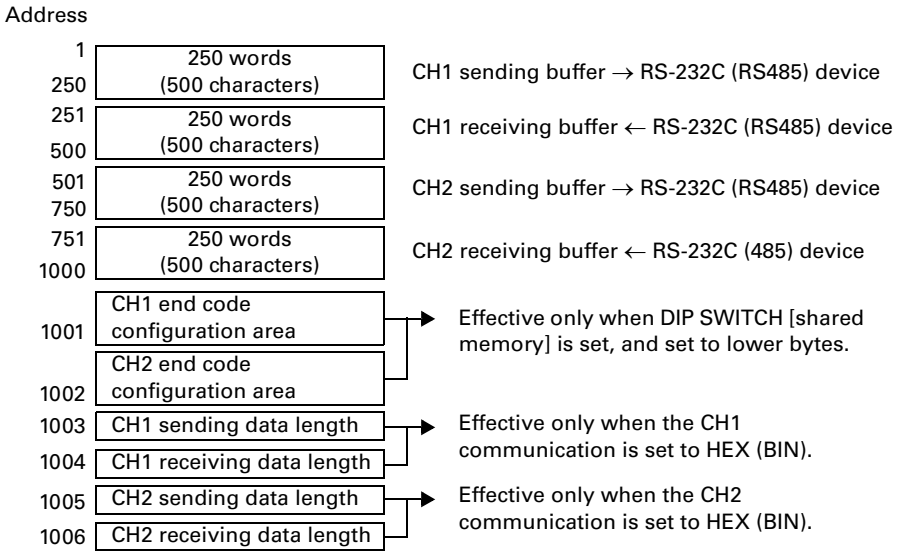
Shared Memory Allocation Table

SCU has built-in shared memory that is READ/WRITE accessible from PLC CPU unit.

Inside the shared memory, the sending and receiving areas are allocated. Therefore, PLC CPU unit and RS232C external devices performs data READ/WRITE through SCU shared memory.

Data transmission handshake is processed at PLC contacts on/off (two points for each input and output).

Shared memory allocation



NOTE Sending buffer area: Data for sending is stored.
Receiving buffer area: Received data is stored.

I/O Allocation Table

The X, Y contact number for I/O is determined by the installation location of the SCU and the number of points of other I/O units.

The I/O numbers shown below are applied when the SCU is installed in slot 0 of base backplane.

For I/O of SCU, 16 points from X0 to XF will be allocated for input and 16 points from Y10 to Y1F will be allocated for output.

The meaning of each I/O contact is shown in the table below and the handshake processing will be based on this status.

Input signal		Event
N-series	N-plus series	
X0	R0.0	**For CH1 sending** X0 (R0.0) turns on when the SCU receives sending data. *1
X1	R0.1	**For CH1 receiving** X1 (R0.1) turns on when normal data is input from devices connected to CH1. *1
X2	R0.2	**For CH2 sending** X2 (R0.2) turns on when the SCU receives sending data. *1
X3	R0.3	**For CH2 receiving** X3 (R0.3) turns on when normal data is input from devices connected to CH2. *1
X4	R0.4	**For CH1 receiving data** X4 (R0.4) turns on only when framing error occurs in received data.
X5	R0.5	**For CH1 receiving data** X5 (R0.5) turns on only when parity error occurs in received data.
X6	R0.6	**For CH1 receiving data** X6 (R0.6) turns on when the received data buffer is full.
X7	R0.7	**For CH1 receiving data** X7 (R0.7) turns on when message length error occurs in received data.
X8	R0.8	**For CH1 sending data** X8 (R0.8) turns on when message length error occurs in sending data.
X9	R0.9	**For CH2 receiving data** X9 (R0.9) turns on only when framing error occurs in received data.
XA	R0.10	**For CH2 receiving data** XA (R0.10) turns on only when parity error occurs in received data.
XB	R0.11	**For CH2 receiving data** XB (R0.11) turns on when the received data buffer is full.
XC	R0.12	**For CH2 receiving data** XC (R0.12) turns on when message length error occurs in received data.
XD	R0.13	**For CH2 sending data** XD (R0.13) turns on when message length error occurs in sending data.
XE	R0.14	**For SCU operation ready indication** XE (R0.14) turns on when SCU initialization completes.
XF	R0.15	Unused

NOTE See *"Timing for Sending and Receiving" on page 25* for detailed information.

Input signal		Event
N-series	N-plus series	
Y10	R1.0	**For CH1 sending** Y10 (R1.0) turns on when sending data is written to shared memory. Turn off Y10 (R1.0) when X0 (R0.0) is turned on.
Y11	R1.1	**For CH1 receiving** Y11 (R1.1) turns on when sending data is read from shared memory. Turn off Y11 (R1.1) when X1 (R0.1) is turned off.
Y12	R1.2	**For CH2 sending** Y12 (R1.2) turns on when sending data is written to shared memory. Turn off Y12 (R1.2) when X2 (R0.2) is turned on.
Y13	R1.3	**For CH2 receiving** Y13 (R1.3) turns on when sending data is read from shared memory. Turn off Y13 (R1.3) when X3 (R0.3) is turned off.
Y14	R1.4	Unused
Y15	R1.5	Unused
Y16	R1.6	Unused
Y17	R1.7	Unused
Y18	R1.8	**Data format setting of CH1** On for ASCII and Off for HEX (Binary) format
Y19	R1.9	**Data format setting of CH2** On for ASCII and Off for HEX (Binary) format
Y1A	R1.10	Unused
Y1B	R1.11	Unused
Y1C	R1.12	Unused
Y1D	R1.13	**For software reset** SCU is initialized when Y1D (R1.13) is turned on. Approx. 1msec after initialization completes, XE (R0.14) turns on. Turn off Y1D (R1.13) immediately after XE (R0.14) turns on.
Y1E	R1.14	**CH1** If Y1E (R1.14) is turned on before data send request turn in Y10 (R1.0), end code will not be transmitted.
Y1F	R1.15	**CH2** If Y1F (R1.15) is turned on before data send request turn in Y12 (R1.2), end code will not be transmitted.

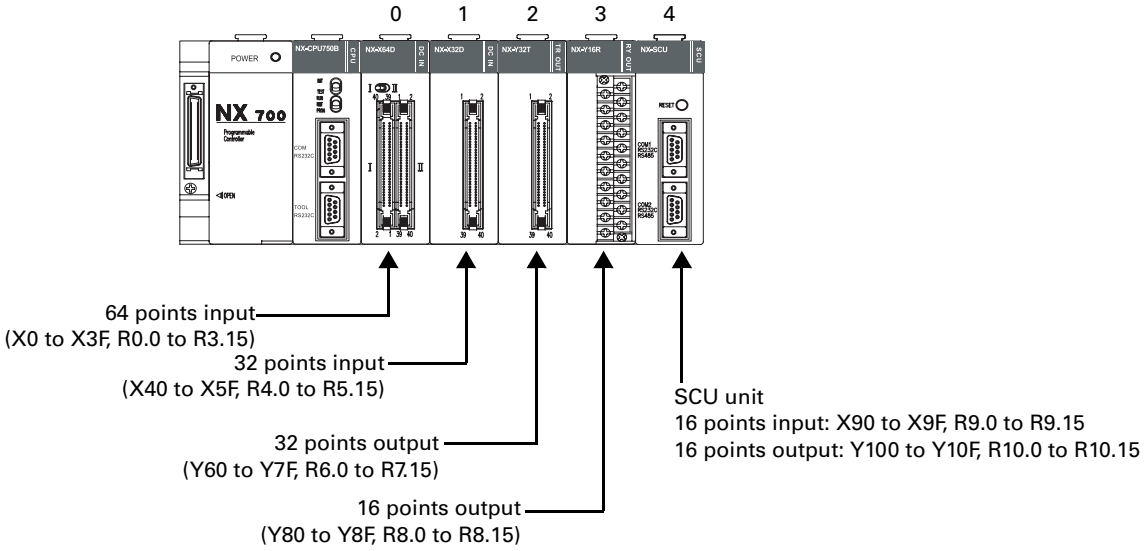
NOTE Data error warning signals (X4 to XD, R0.4 to R0.13) turn off when SCU reset switch is pressed or normal data is received.

NX70, NX700 PLC Installation Example

NX700 PLC system configuration is illustrated below.

In this case, the SCU is installed in slot no.4 and I/O units are installed in slot no. 0 to 3.

Base backplane (5 slots)



IMPORTANT

- There is no limit on the location and number of SCU installed, and SCU can be installed regardless whether the backplane is base or expansion.
- When allocating I/O map with WinFPST, SCU is allocated as "16SX and 16SY".
- When allocating I/O map with WinGPC, SCU is allocated as "Both".

PLC Programming Examples

Self-Test Program for WinFPST

Example of ladder program that performs self-loop at the SCU.

Convenient program for self-test of the SCU.

Operation description

Send data from CH1 and receive it at CH2, and compare the sent and received data.

Send data from CH2 and receive it at CH1, and compare the sent and received data.

Y50 turns on when the compared data are not identical.

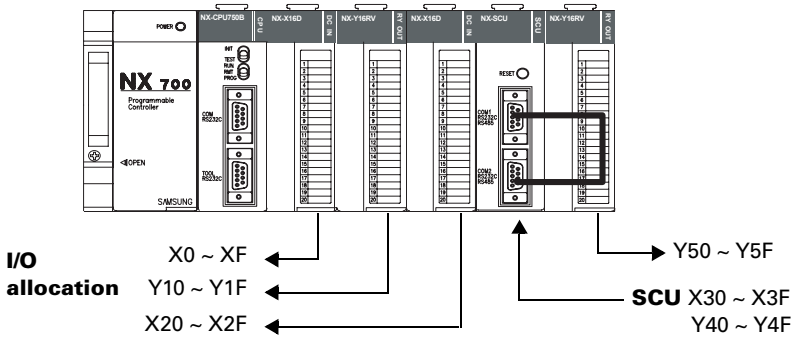
IMPORTANT

- Data WRITE method: WinFPST S/W → on-line → DT0, DT1 and DT5, DT6 at register monitoring. Then, verify data at each of DT10, DT11 and DT15, DT16. (See WinFPST S/W help for detailed information.)
- DIP SWITCH (DSW) setting must be identical at CH1 and CH2, and the setting is arbitrary.
- PLC system configuration example shows a NX700 PLC system (NX-CPU700, NX-CPU750A, B, C, or D), with a SCU installed in base backplane slot 3.
- Use 9-pin cable when RS232C communication checking at CH1 and CH2 of the SCU, and use 2-pin connection when RS485 communication checking. (See the wiring

System Configuration

(NX-CPU700, NX-CPU750A, B, C, D)

Base backplane (5 slots)



CH1 and CH2 PIN wiring diagram

For RS-232C communication checking

SCU (CH1)

PIN NO	Mnemonic
1	FG
2	SD
3	RD
4	
5	SG
6	
7	
8	
9	

SCU (CH2)

PIN NO	Mnemonic
1	FG
2	SD
3	RD
4	
5	SG
6	
7	
8	
9	

For RS-485 communication checking

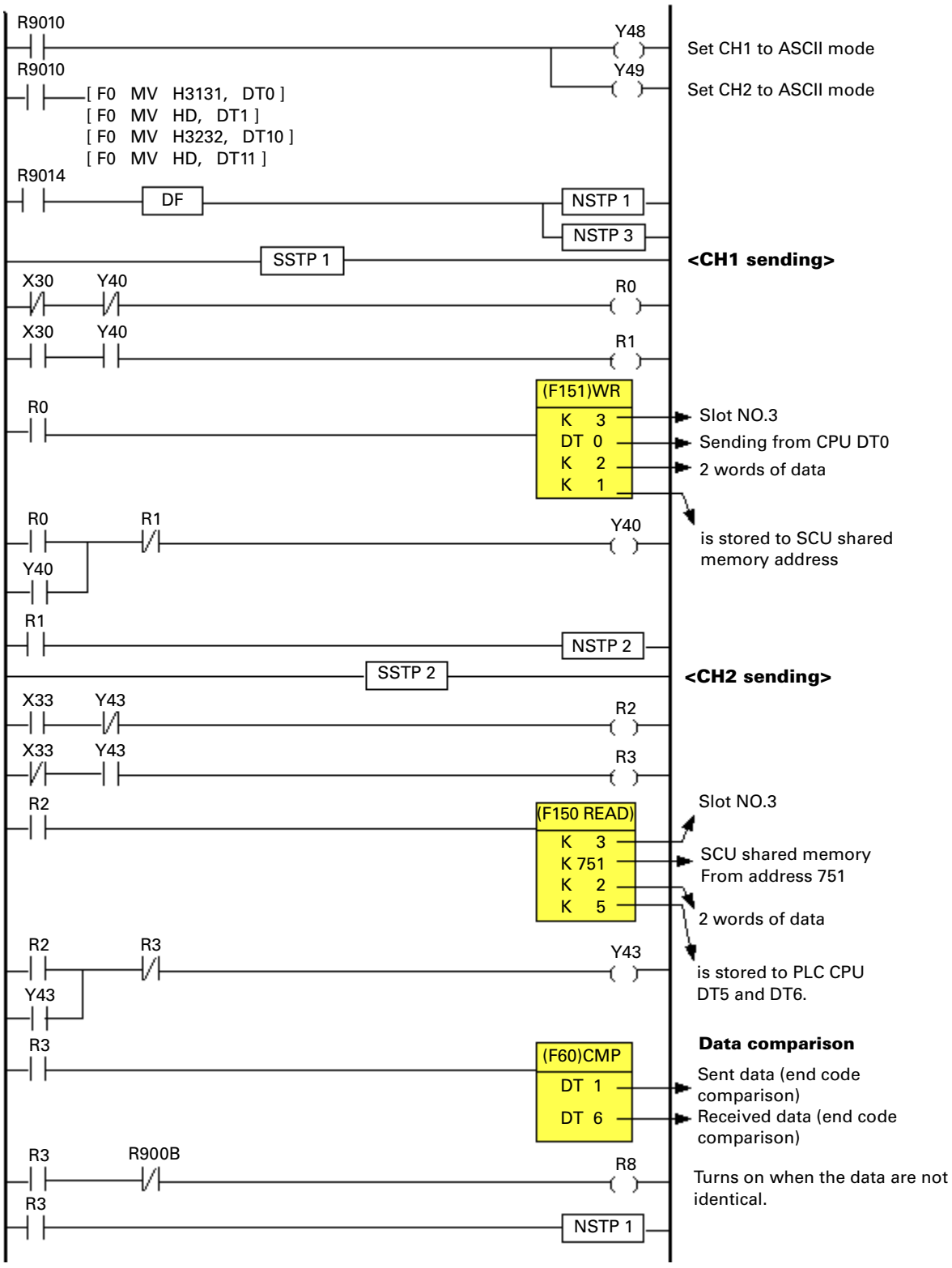
SCU (CH1)

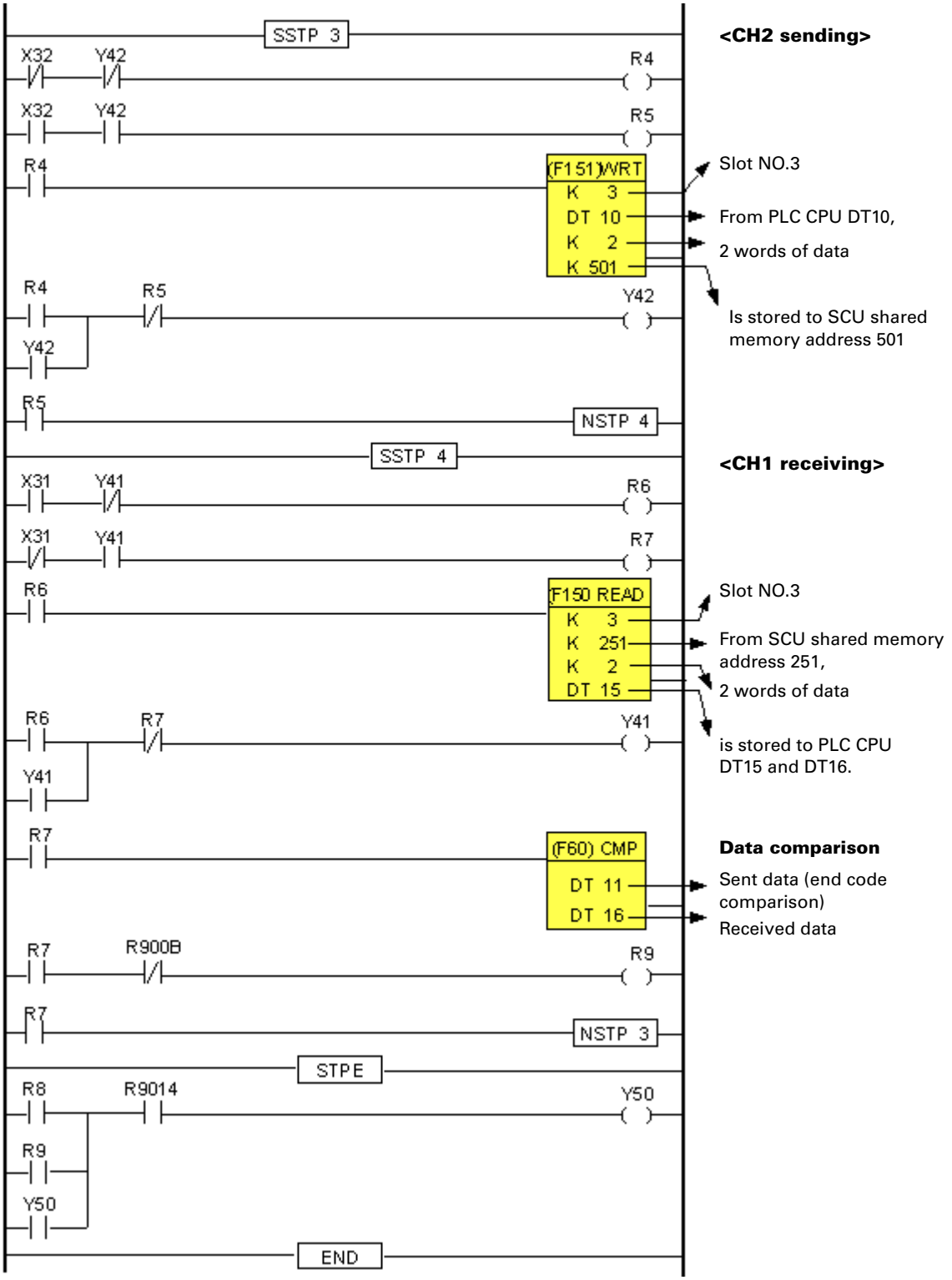
PIN NO	Mnemonic
1	
2	
3	
4	
5	
6	485-
7	485+
8	
9	

SCU (CH2)

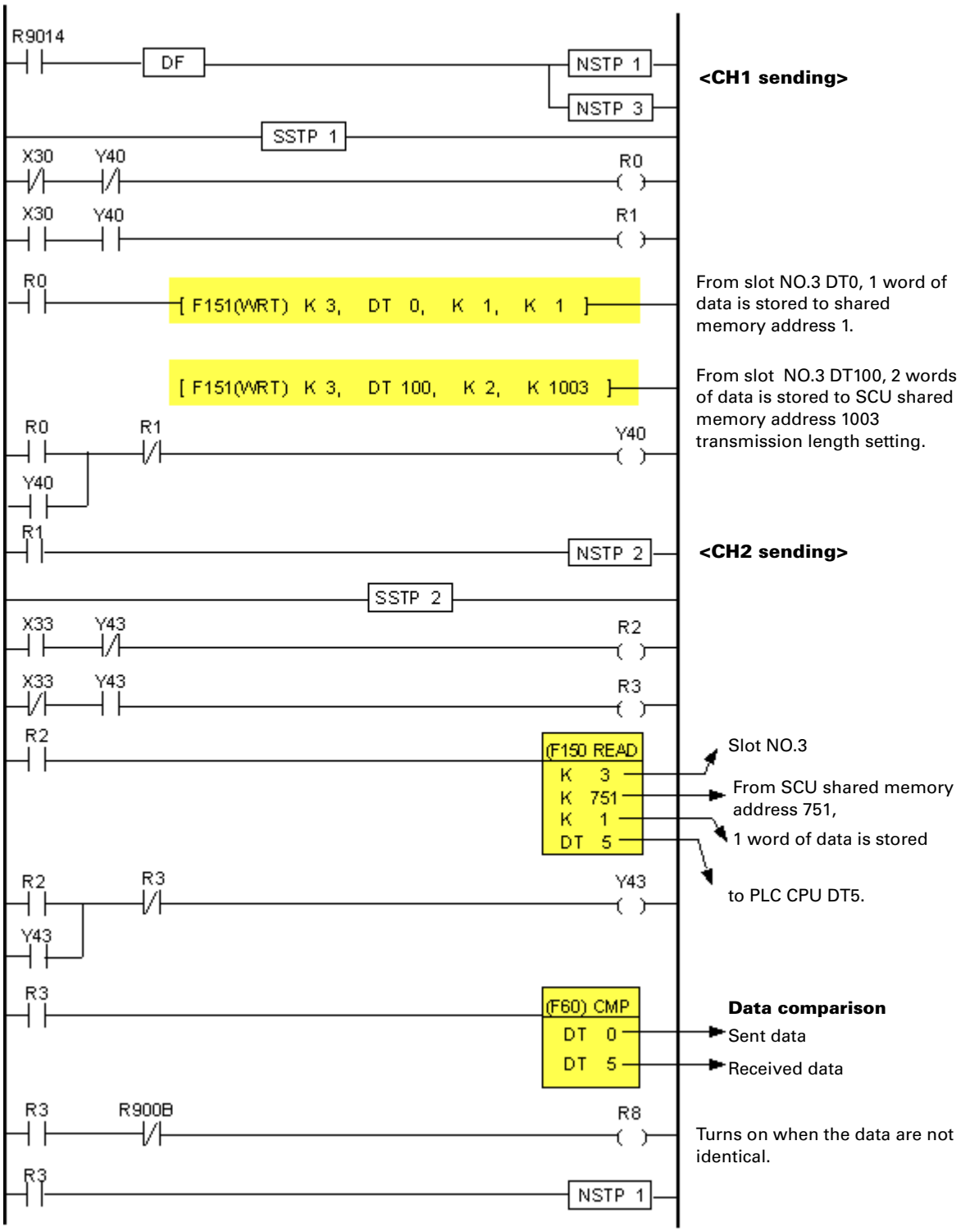
PIN NO	Mnemonic
1	
2	
3	
4	
5	
6	485-
7	485+
8	
9	

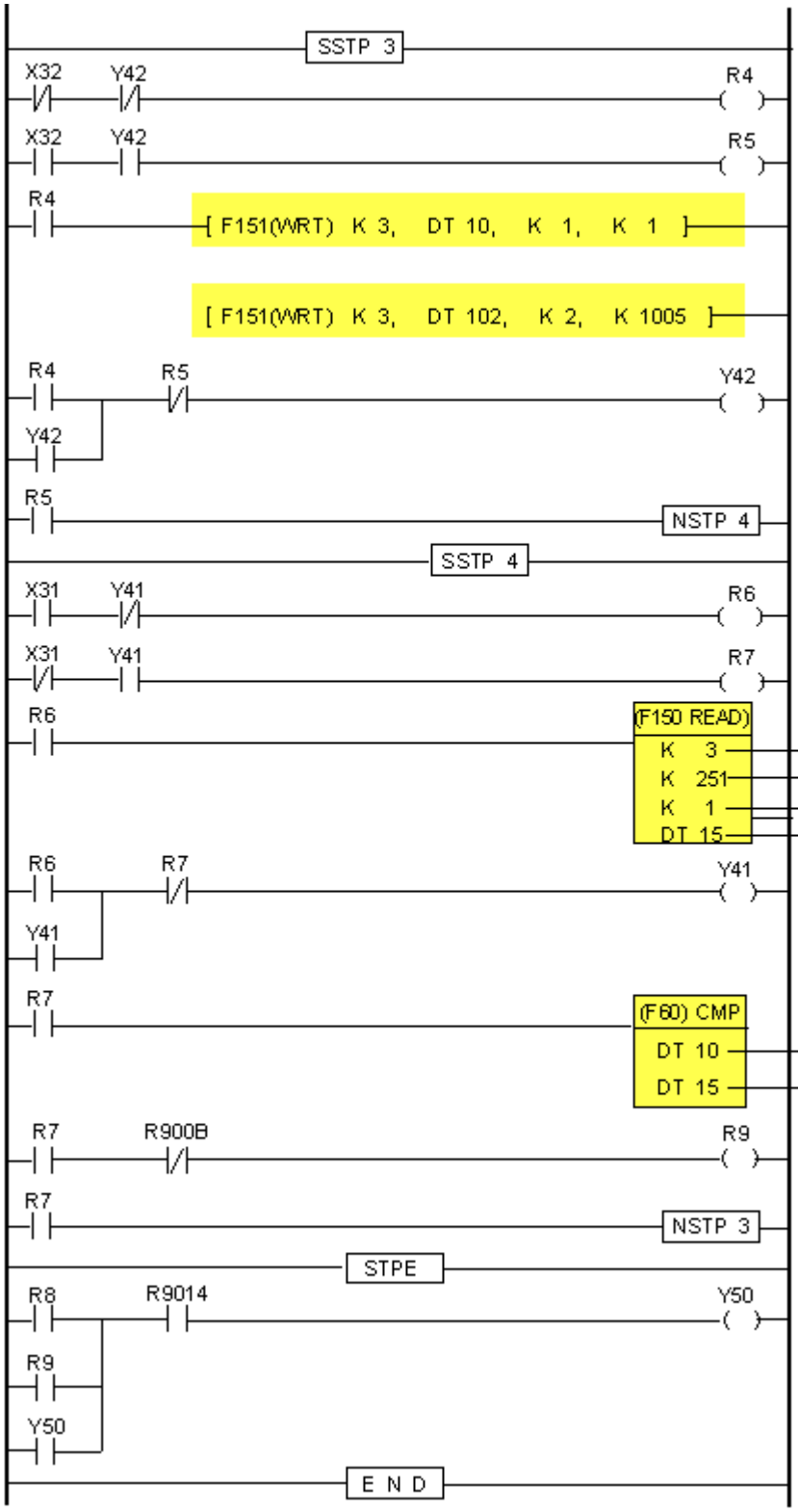
Sequence Program - ASCII format self-test ladder program (for WinFPST)




SSTP 3
X32
Y42
R4
X32
Y42
R5
R4
(F151)WRT
K 3
DT 10
K 2
K 501
R4
R5
Y42
Y42
R5
NSTP 4
SSTP 4
X31
Y41
R6
X31
Y41
R7
R6
F150 READ
K 3
K 251
K 2
DT 15
R6
R7
Y41
Y41
R7
(F60) CMP
DT 11
DT 16
R7
R900B
R9
R7
NSTP 3
STPE
R8
R9014
Y50
R9
Y50
END
<CH2 sending>
Slot NO.3
From PLC CPU DT10,
2 words of data
Is stored to SCU shared memory address 501
<CH1 receiving>
Slot NO.3
From SCU shared memory address 251,
2 words of data
is stored to PLC CPU DT15 and DT16.
Data comparison
Sent data (end code comparison)
Received data

Sequence program - HEX format self-test ladder program (for WinFPST)





<CH2 sending>

From slot NO.3 DT0, 1 word of data is stored to SCU shared memory address 501.

From slot NO.3 DT102, 2 words of data is stored to SCU shared memory address 1005. (transmission length setting)

<CH1 receiving>

Slot NO.3

From SCU shared memory address 251,

1 word of data is stored

to PLC CPU DT15.

Data comparison

Sent data

Received data

Self-Test Program for WinGPC

Example of ladder program that performs self-loop at the SCU.

Convenient program for self-test of the SCU.

Operation description

Send data from CH1 and receive it at CH2, and compare the sent and received data.

Send data from CH2 and receive it at CH1, and compare the sent and received data.

R5.0 turns on when the compared data are not identical.

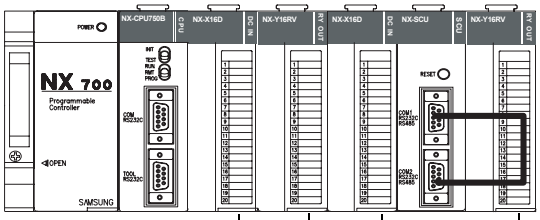
IMPORTANT

- Write 2-byte data(includes end code "CR") into W0 and W10 before program execution.
- The data is written using by WinGPC S/W.
- PLC system configuration example shows a NX700 PLC system (NX-CPU700p), with a SCU installed in base backplane slot 3.
- Used the same DIP Switch setting for both Ch1 and

System Configuration

(NX-CPU700p)

Base backplane (5 slots)



I/O allocation

R0.0 to R0.15
R1.0 to R1.15
R2.0 to R2.15
R5.0 to R5.15
SCU R3.0 to R3.15
R4.0 to R4.15

CH1 and CH2 PIN wiring diagram

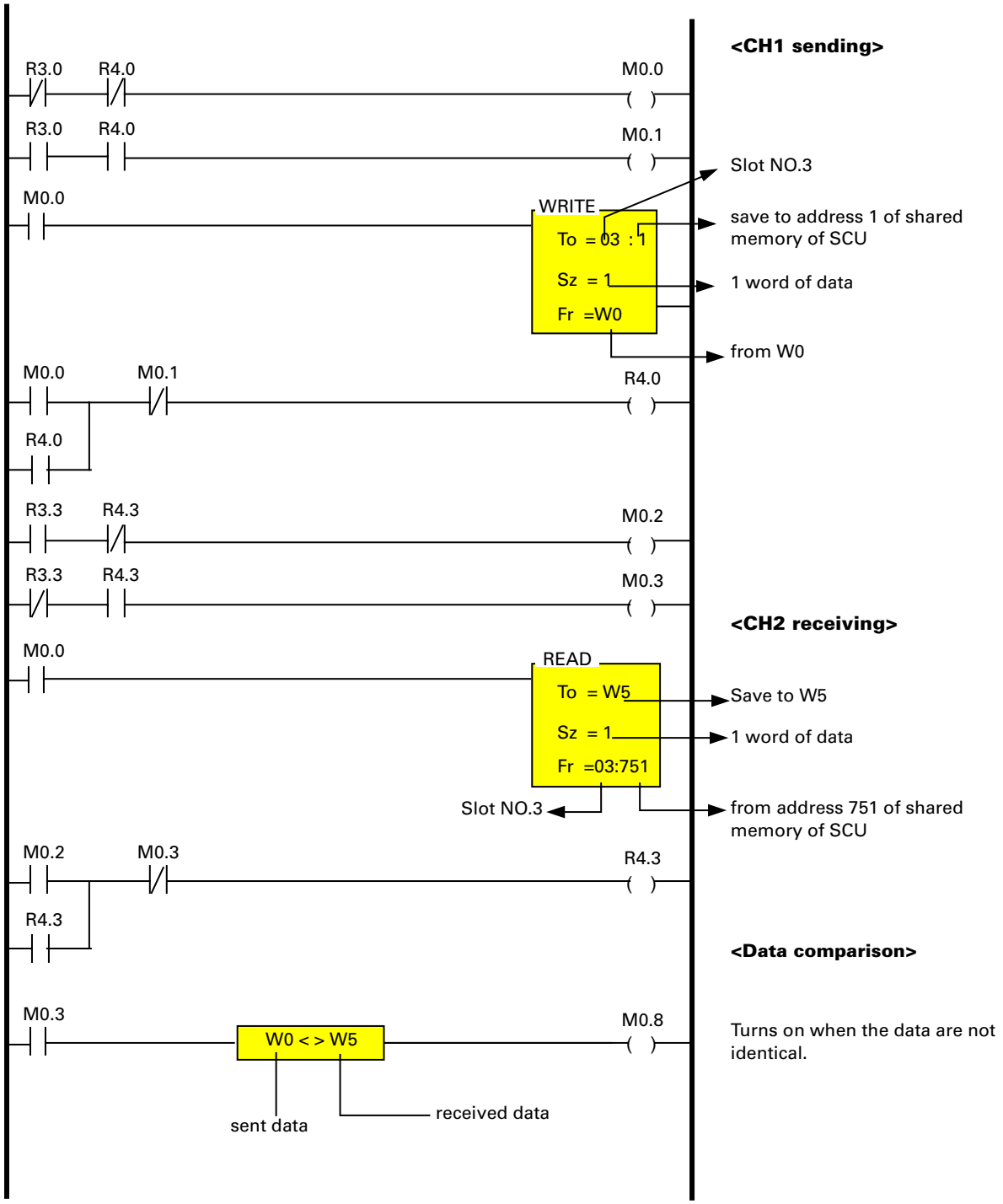
For RS-232C communication checking

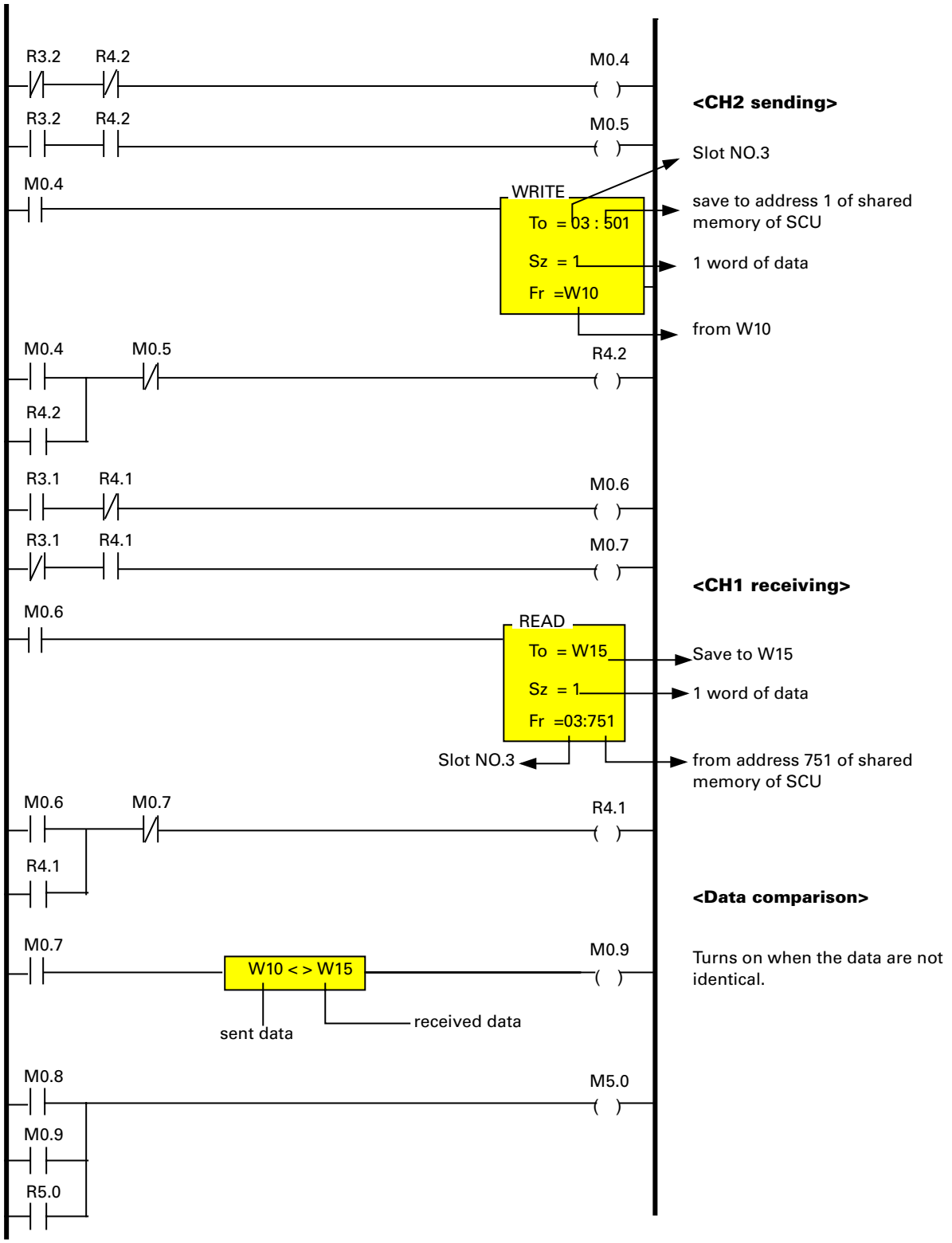
SCU (CH1)		SCU (CH2)	
PIN NO	**Mnemonic**	**PIN NO**	**Mnemonic**
1	FG	1	FG
2	SD	2	SD
3	RD	3	RD
4		4	
5	SG	5	SG
6		6	
7		7	
8		8	
9		9	

For RS-485 communication checking

SCU (CH1)		SCU (CH2)	
PIN NO	**Mnemonic**	**PIN NO**	**Mnemonic**
1		1	
2		2	
3		3	
4		4	
5		5	
6	485-	6	485-
7	485+	7	485+
8		8	
9		9	

Sequence Program - ASCII format self-test ladder program (for WinGPC)




R3.2
R4.2
M0.4
R3.2
R4.2
M0.5
<CH2 sending>
Slot NO.3
M0.4
WRITE
To = 03 : 501
save to address 1 of shared memory of SCU
Sz = 1
1 word of data
Fr =W10
from W10
M0.4
M0.5
R4.2
R4.2
R3.1
R4.1
M0.6
R3.1
R4.1
M0.7
<CH1 receiving>
M0.6
READ
To = W15
Save to W15
Sz = 1
1 word of data
Fr =03:751
Slot NO.3
from address 751 of shared memory of SCU
M0.6
M0.7
R4.1
R4.1
<Data comparison>
M0.7
W10 < > W15
M0.9
Turns on when the data are not identical.
sent data
received data
M0.8
M5.0
M0.9
R5.0

Example of Using a Barcode Reader for WinFPST

Connect a barcode reader to SCU CH1.
(ex. Barcode reader: (Japan) TOKEN THLS-6300)

Read barcode information and store it to PLC.

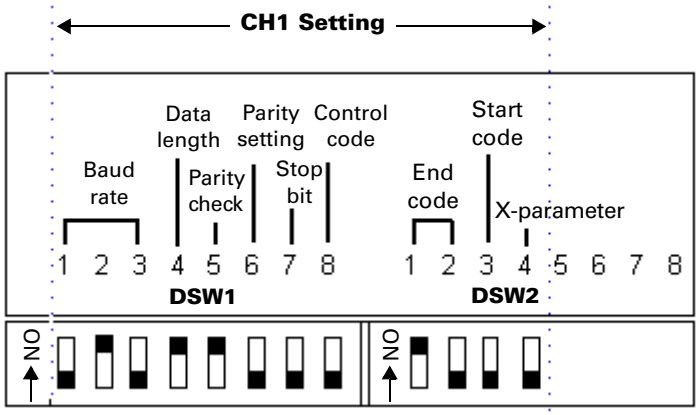
Operation description

Read the information at the barcode reader connected to CH1 and store it to from PLC DT100.

IMPORTANT

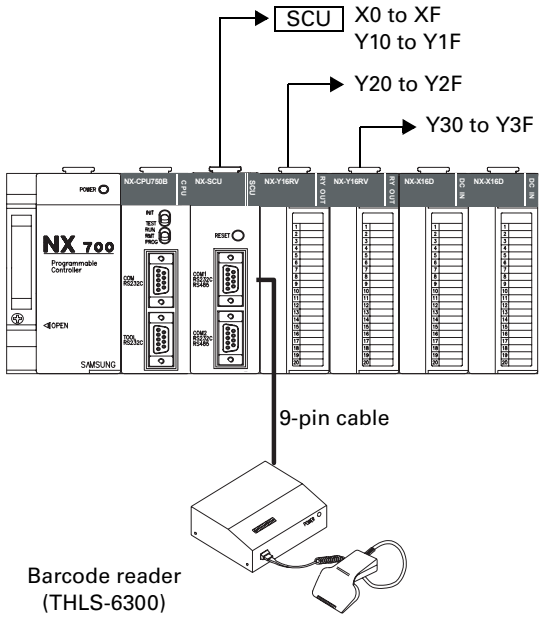
- The DIP switches (DSW1 and DSW2) are set to 9600 bps, 8 bit, no parity, 1 stop bit, and end code is CR.
- SCU is installed in base backplane slot 0 of a NX700 PLC system (NX-CPU700, NX-CPU750A, B, C, D).
- Connect SCU CH1 and barcode reader with 9-pin cable.

SCU DIP switch (CH1) settings

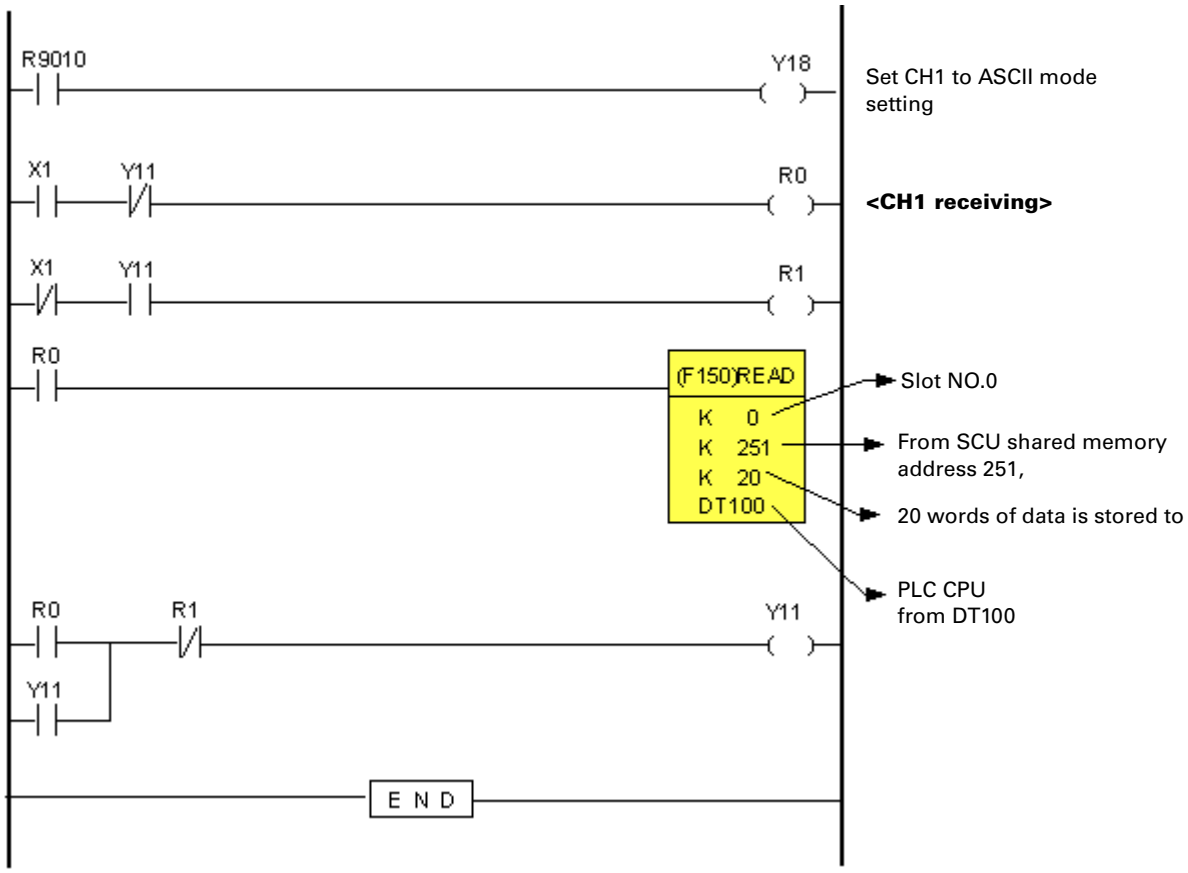


NX700 System Configuration

(NX-CPU700, NX-CPU750A, B, C, D)



Sequence Program – Ladder program example for using a barcode reader (for WinFPST)



Example of Using a Barcode Reader for WinGPC

Connect a barcode reader to SCU CH1.
(ex. Barcode reader: (Japan) TOKEN THLS-6300)

Read barcode information and store it to PLC.

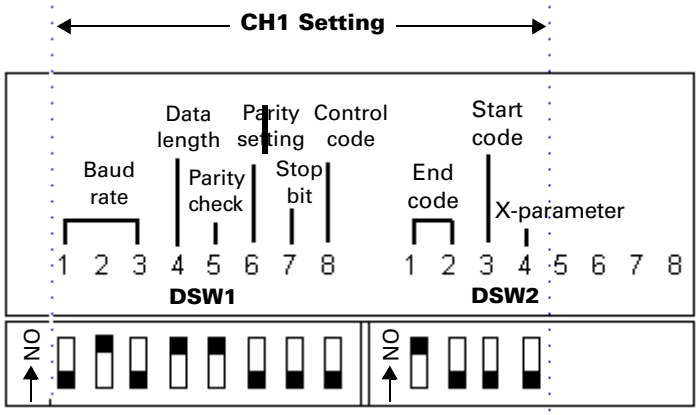
Operation description

Read the information at the barcode reader connected to CH1 and store it to from PLC DT100.

IMPORTANT

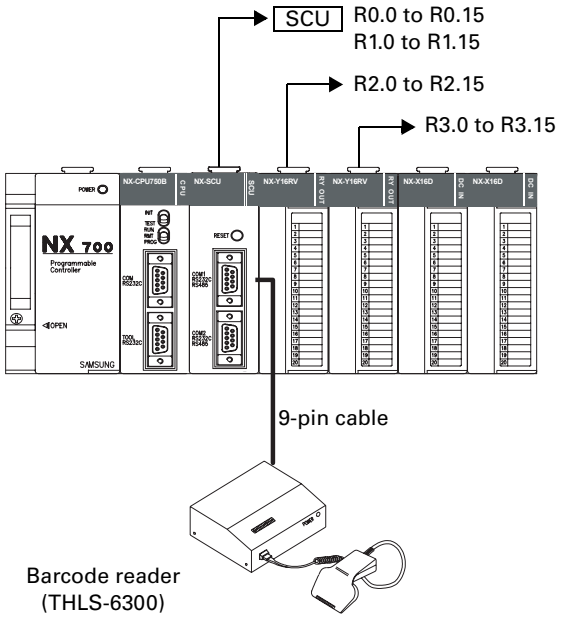
- The DIP switches (DSW1 and DSW2) are set to 9600 bps, 8 bit, no parity, 1 stop bit, and end code is CR.
- SCU is installed in base backplane slot 0 of a NX700 PLC system (NX-CPU700p).
- Connect SCU CH1 and barcode reader with 9-pin cable.

SCU DIP switch (CH1) settings

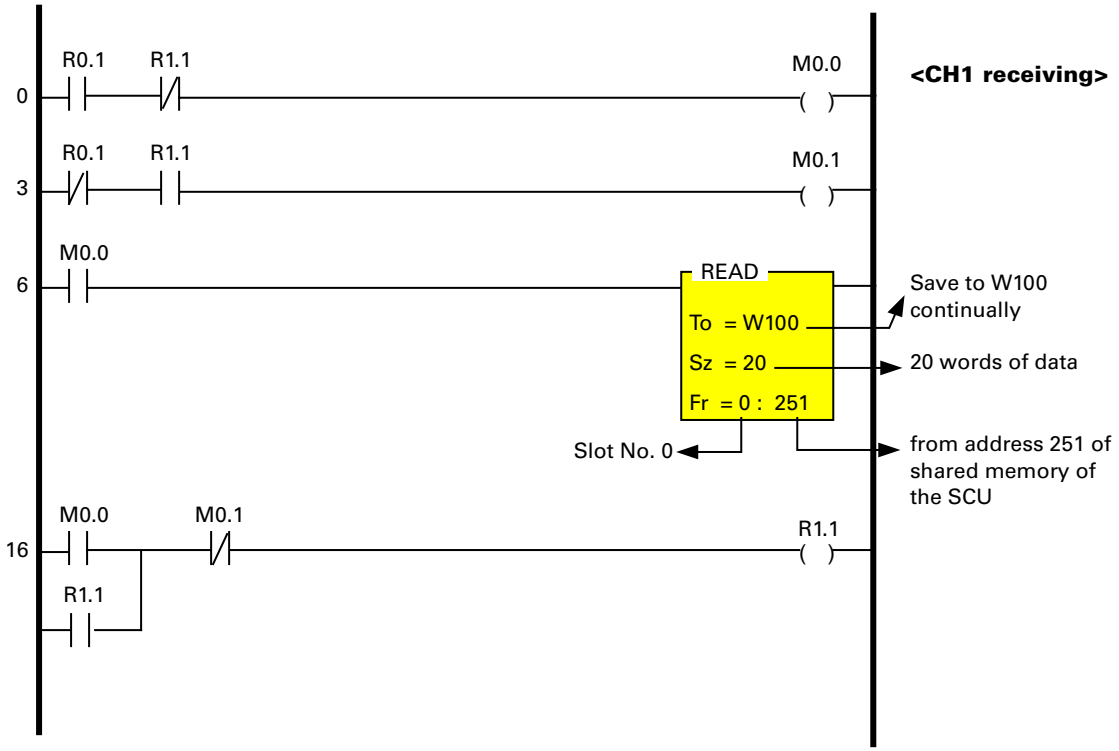


NX700 System Configuration

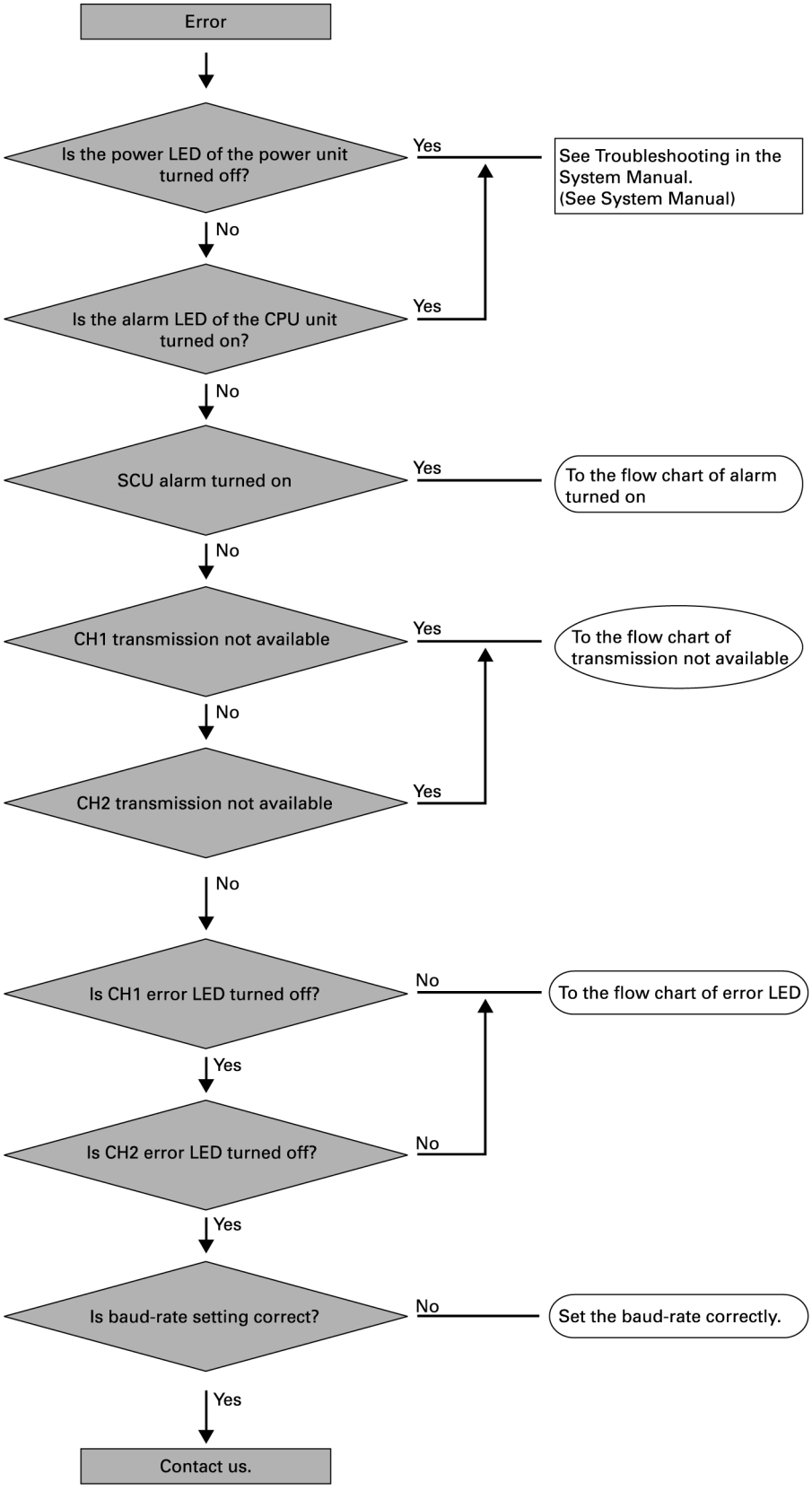
(NX-CPU700p)

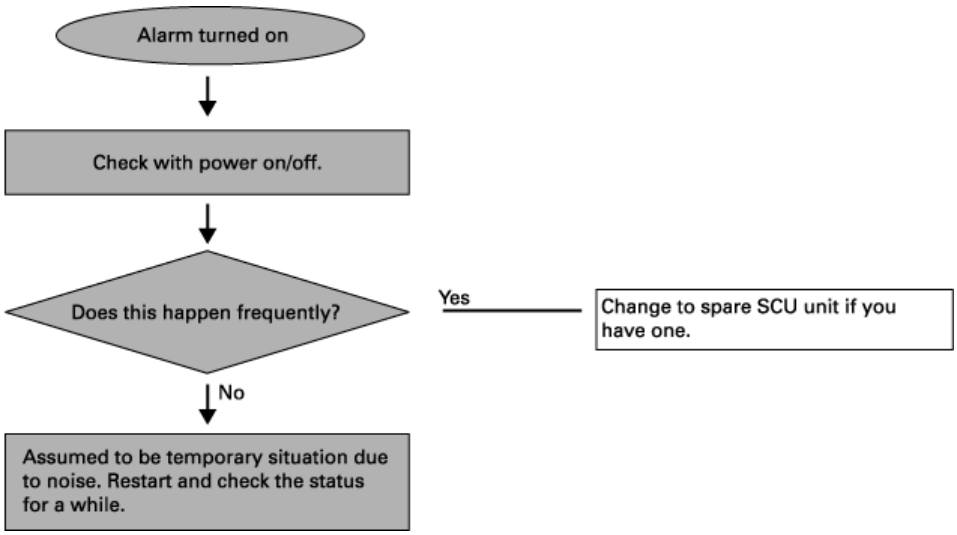


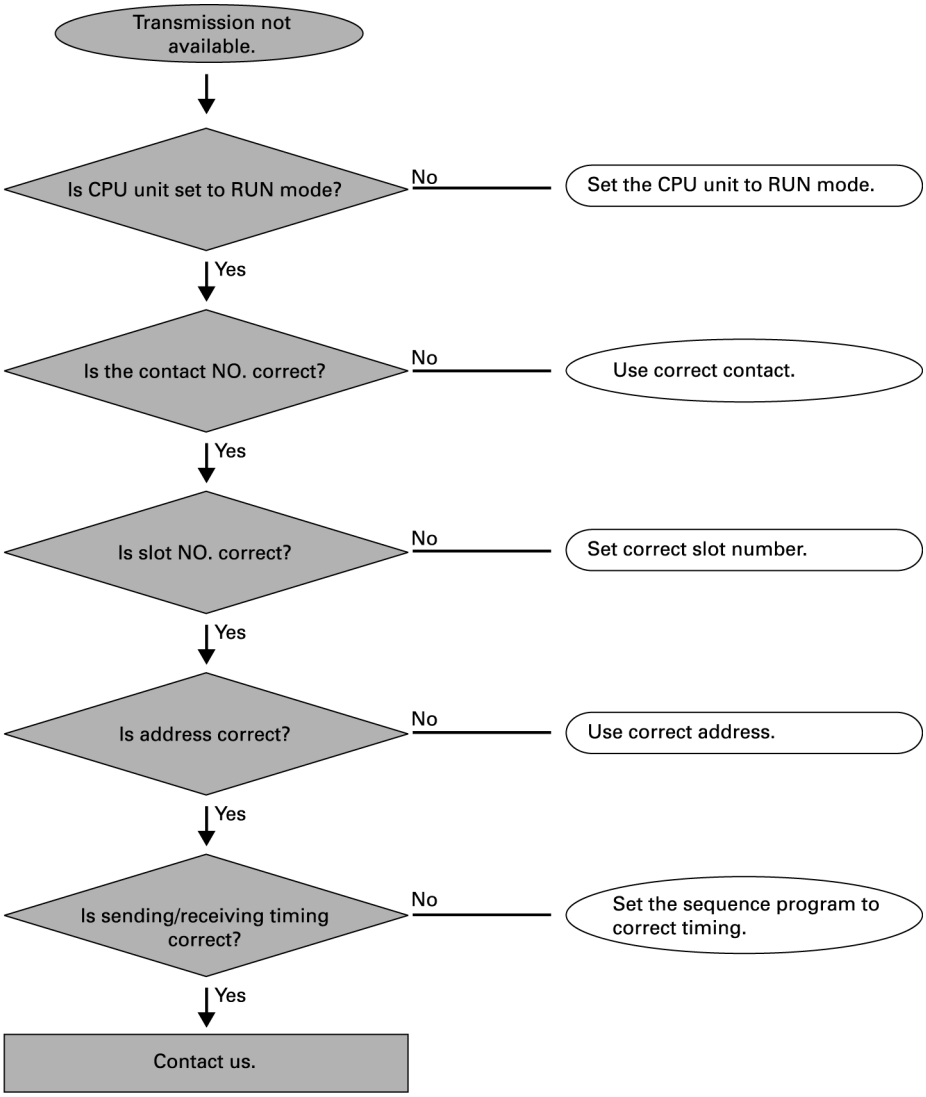
Sequence Program – Ladder program example for using a barcode reader (for WinGPC)

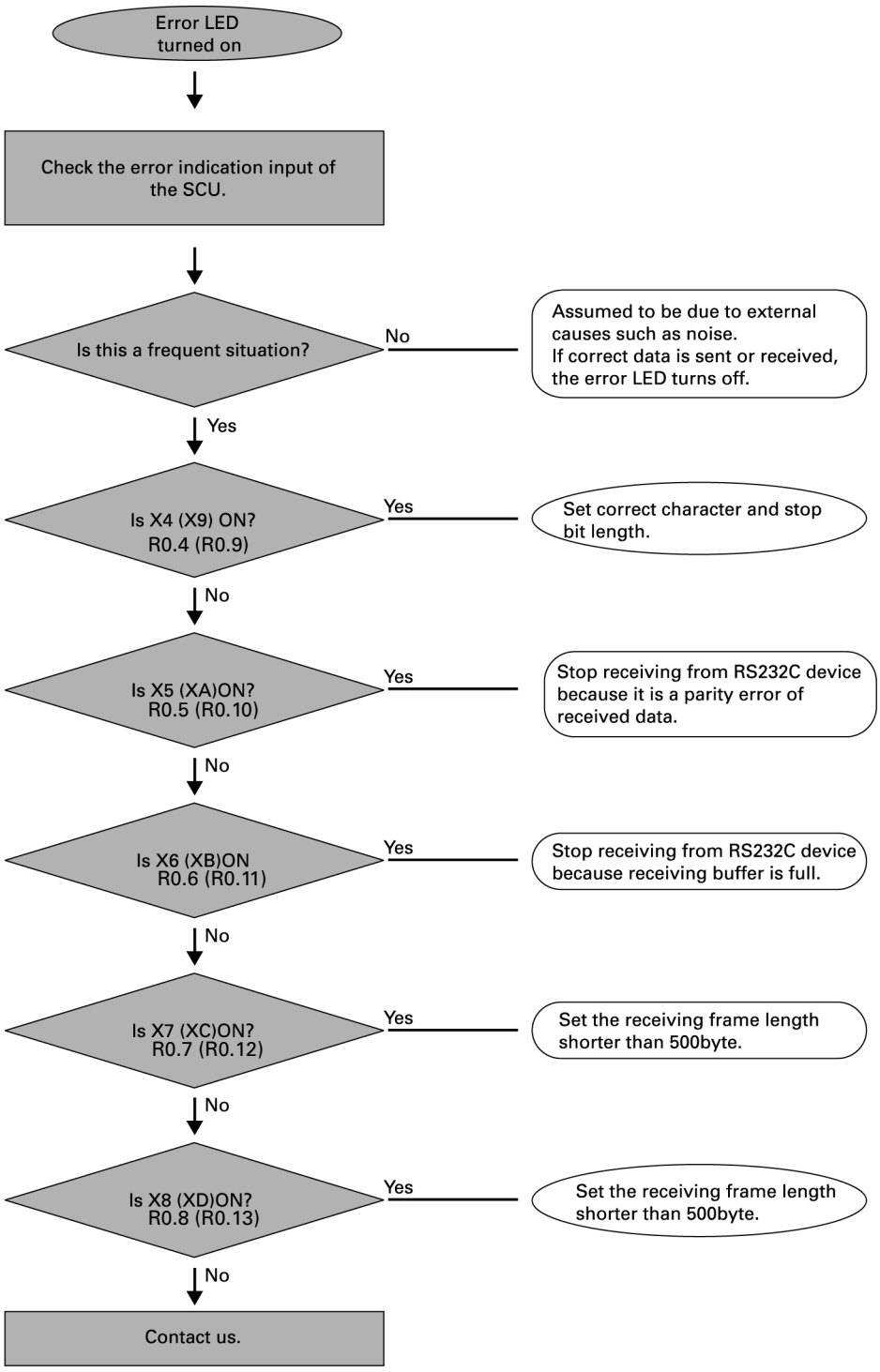


Troubleshooting




Alarm turned on
Check with power on/off.
Does this happen frequently?
Yes
Change to spare SCU unit if you have one.
No
Assumed to be temporary situation due to noise. Restart and check the status for a while.


Transmission not available.
Is CPU unit set to RUN mode?
No
Set the CPU unit to RUN mode.
Yes
Is the contact NO. correct?
No
Use correct contact.
Yes
Is slot NO. correct?
No
Set correct slot number.
Yes
Is address correct?
No
Use correct address.
Yes
Is sending/receiving timing correct?
No
Set the sequence program to correct timing.
Yes
Contact us.

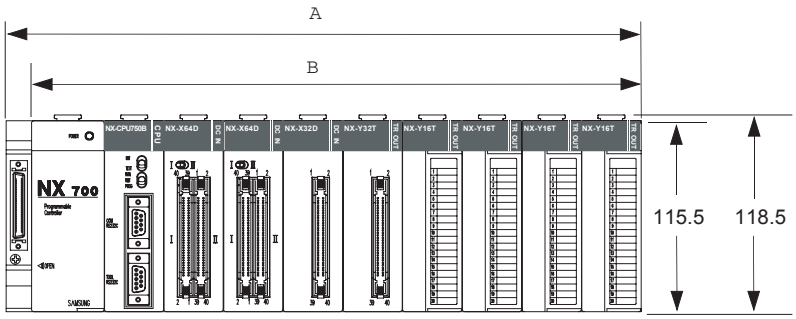

Error LED turned on
Check the error indication input of the SCU.
Is this a frequent situation?
No
Assumed to be due to external causes such as noise. If correct data is sent or received, the error LED turns off.
Yes
Is X4 (X9) ON? R0.4 (R0.9)
Yes
Set correct character and stop bit length.
No
Is X5 (XA)ON? R0.5 (R0.10)
Yes
Stop receiving from RS232C device because it is a parity error of received data.
No
Is X6 (XB)ON R0.6 (R0.11)
Yes
Stop receiving from RS232C device because receiving buffer is full.
No
Is X7 (XC)ON? R0.7 (R0.12)
Yes
Set the receiving frame length shorter than 500byte.
No
Is X8 (XD)ON? R0.8 (R0.13)
Yes
Set the receiving frame length shorter than 500byte.
No
Contact us.

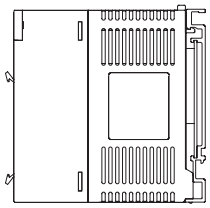
The SCU is mounted in slot 0, and the contact number in ( ) is the contact number of CH2 error indication.

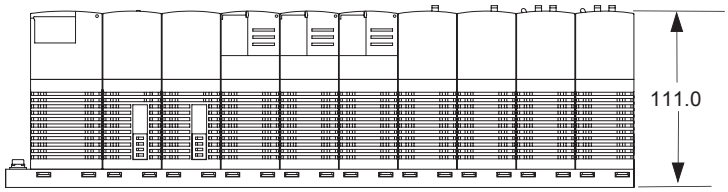
Product Dimensions and Installation

NX700 PLC Product Dimensions

System Dimensions (mm)



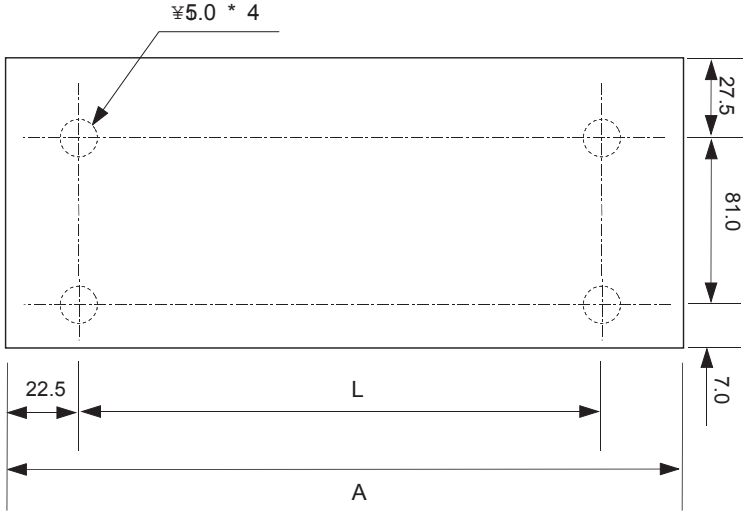




unit (mm)

Slot Types	Dimensions	
	A	B
3-slot type	205.0	183.8
5-slot type	276.0	254.2
8-slot type	381.0	359.8
10-slot type	452.0	430.2
12-slot type	522.0	500.6

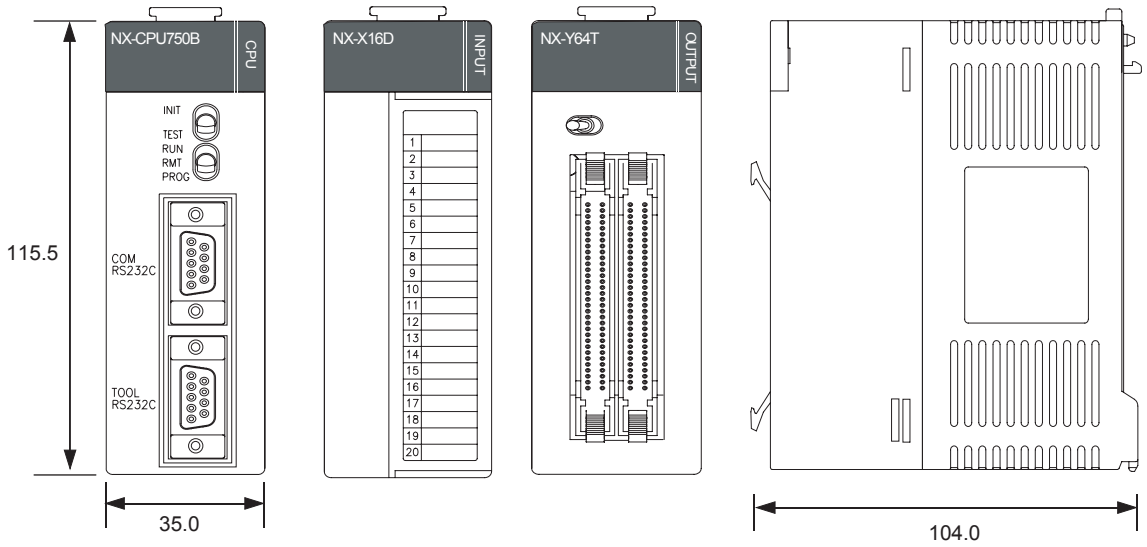
Motherboard Installation Diagram (mm)



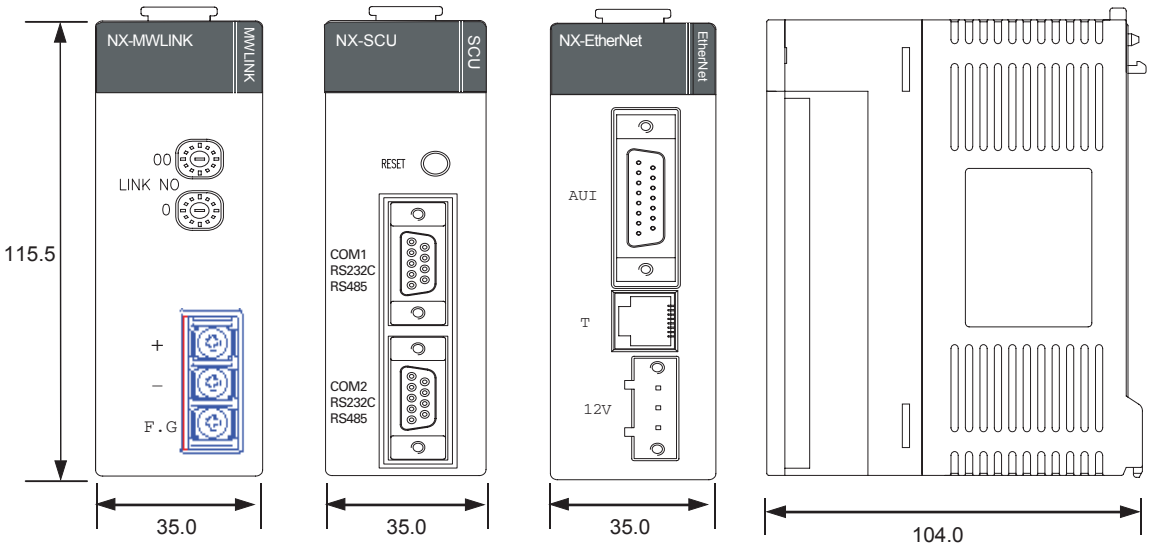
unit (mm)

SLOT	A	L
3-slot type	205.0	153.8
5-slot type	276.0	224.2
8-slot type	381.0	329.8
10-slot type	452.0	400.2
12-slot type	522.0	470.6

CPU, I/O, Module Dimensions (mm)

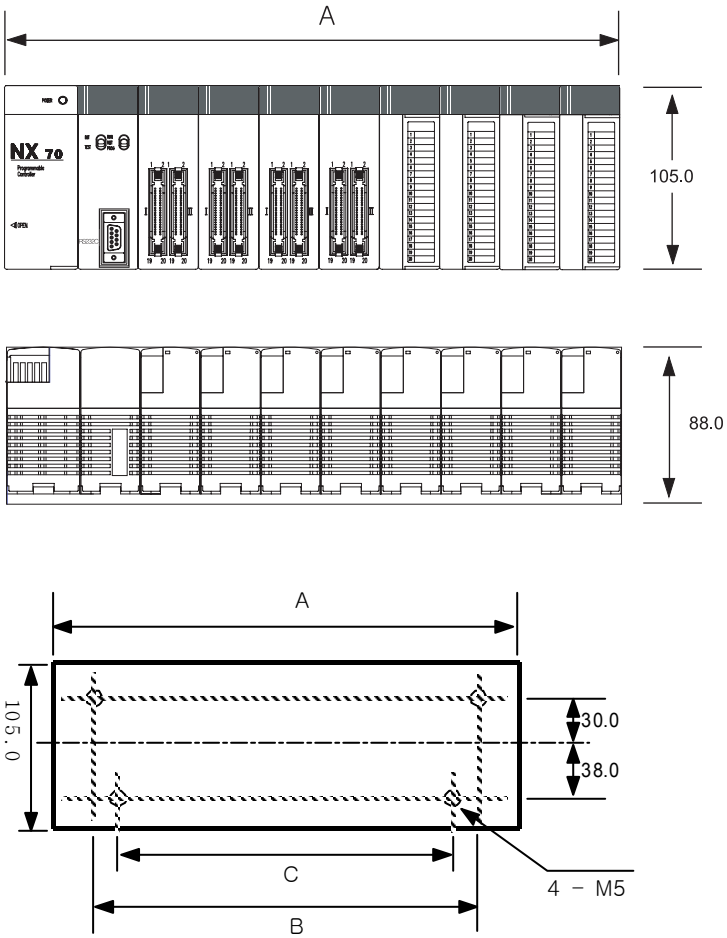


SCU Unit and Special Unit Dimensions (mm)



NX70 PLC Product Dimensions

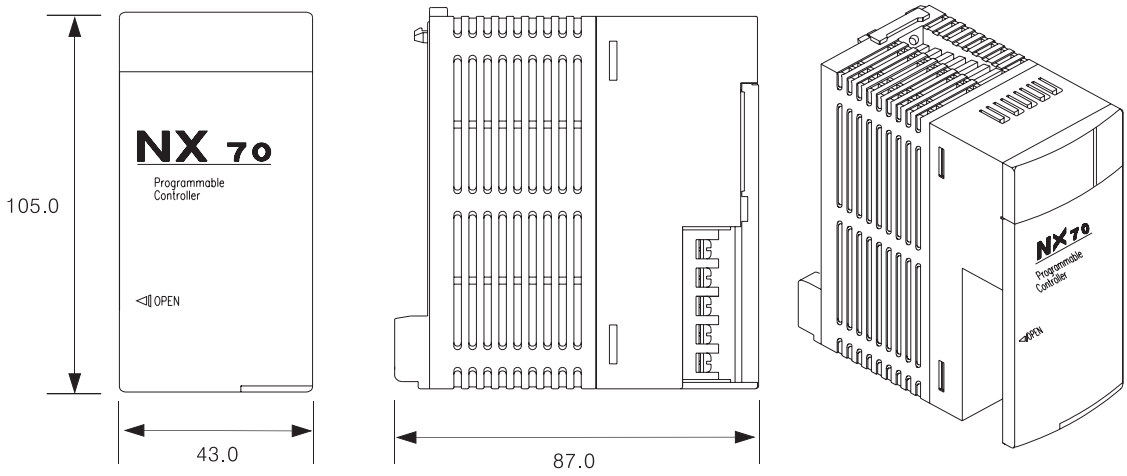
System Dimensions (mm)



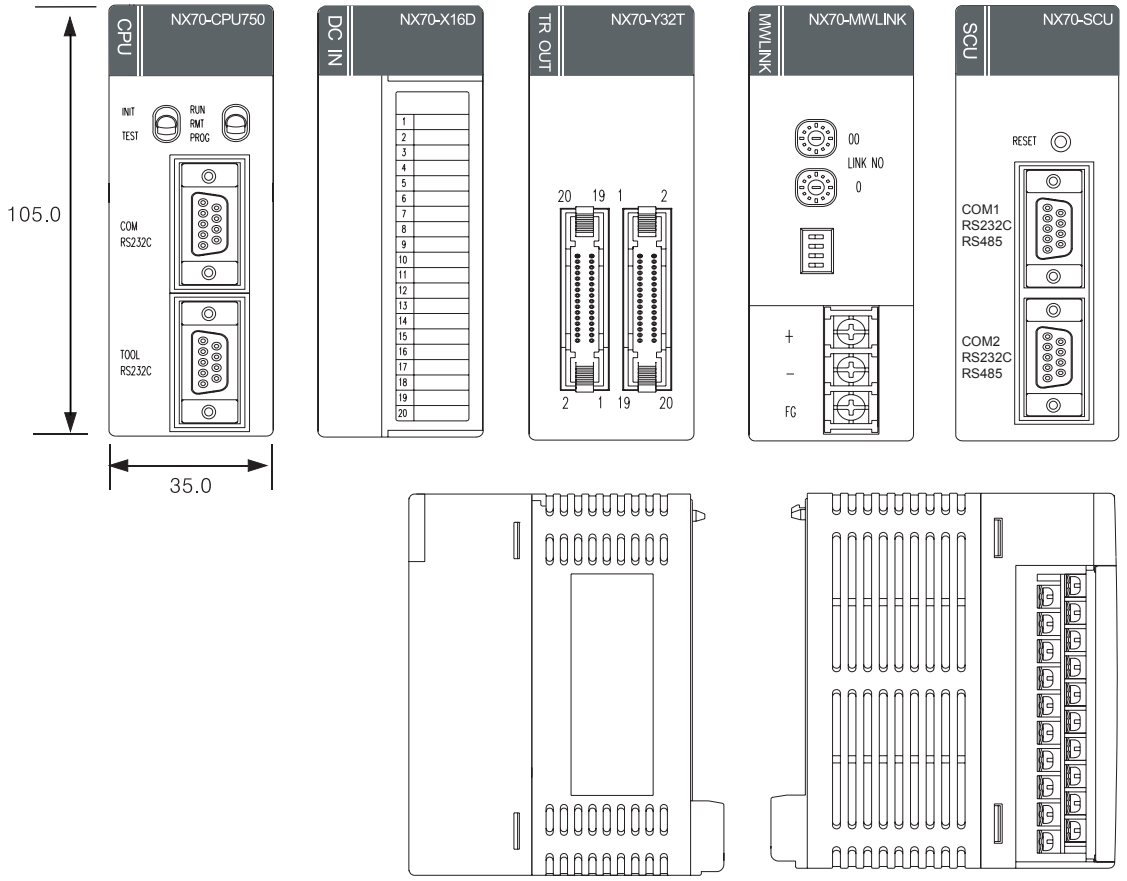
unit (mm)

Slot Types	Catalog Number	Dimensions (A)	Dimensions (B)	Dimensions (C)
2-slot type	NX70-BASE02	149.5	129.5	115.5
3-slot type	NX70-BASE03	185.0	165.0	151.0
5-slot type	NX70-BASE05	256.0	236.0	222.0
6-slot type	NX70-BASE06	291.5	271.5	257.5
8-slot type	NX70-BASE08	362.5	342.5	328.5
10-slot type	NX70-BASE10	398.0	378.0	364.0
12-slot type	NX70-BASE12	433.5	413.5	399.5

Power Unit Dimensions(mm)



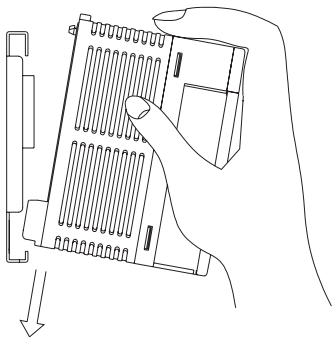
CPU, I/O, Special Unit Dimensions (mm)



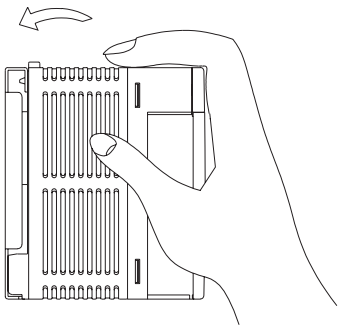
Installation

Installation

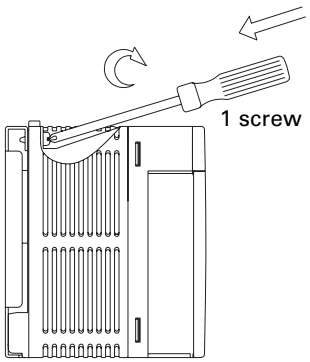
1. Insert the module holding projector of the module into the module holding groove on the backplane.



2. Push the top of the module toward the backplane until it is clamped in place.

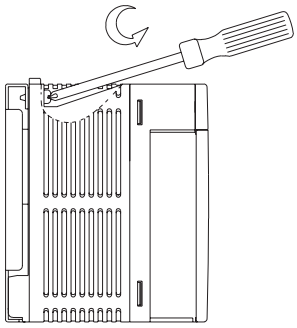


3. Ensure that the module is in place onto the backplane, and then fasten the screw using a screwdriver.

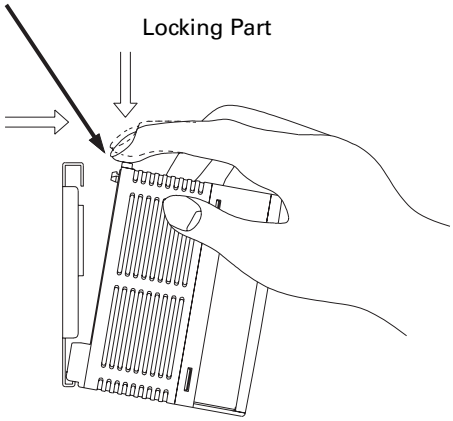


Removal

1. Unfasten the screw that holds the module in place using a screwdriver.



2. Hold on pressing the locking button on the edge of the top side of the module, and pull the module from the backplane.



NX70/NX700 Serial Communications Unit (SCU) User Manual

www.samsungautomation.co.kr

Rockwell Samsung Automation

447-6, Gongse-Ri, Giheung-Eup, Youngin-City,
Gyeonggi-Do, South Korea, 449-902
Tel: 82-31-280-4700 Fax: 82-31-280-4900

Technical Support

Export Sales Team
Tel: 82-31-280-4768 Fax: 82-31-280-4900

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